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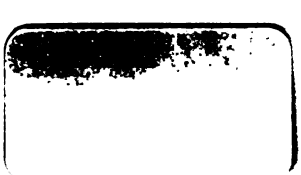

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OF THE

AMERICAN DENTAL ASSOCIATION

AT THE

TWENTY-SECOND ANNUAL SESSION,

HELD AT CINCINNATI.

COMMENCING ON THE 1ST OF AUGUST, 1882.

PUBLICATION COMMITTEE:

GEO. H. CUSHING, A. W. HARLAN, E. T. DARBY.

PHILADELPHIA:
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LIST OF OFFICERS FROM DATE OF ORGANIZATION.

PRELIMINARY CONVENTION, NIAGARA FALLS, AUGUST, 1859.

President,	W. W. ALLPORT	Chicago.
Secretary,	J. TAFT	Cincinnati.

ORGANIZATION AND FIRST SESSION OF ASSOCIATION, WASHINGTON, D. C., JULY, 1860.

[Annual meetings to be hereafter last Tuesday in July.]

President,	W. H. ATKINSON	Cleveland.
1st Vice-President,	J. B. GIBBS	Washington, D. C.
2d Vice-President,	W. CAHOON	Detroit, Mich.
Recording Secretary,	J. TAFT	Cincinnati.
Corresponding Secretary,	W. MUIR ROGERS	Shelbyville, Ky.
Treasurer,	S. DILLINGHAM	Philadelphia.

[NO MEETING IN 1861.]

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1st Vice-President,	W. H. ALLEN	New York City.
2d Vice-President,	W. D. STONE	Lexington, Ky.
Recording Secretary,	J. TAFT	Cincinnati.
Corresponding Secretary,	J. F. JOHNSTON	Indianapolis.
Treasurer,	W. A. PEASE	Dayton, Ohio.

PHILADELPHIA, JULY, 1863.

President,	W. H. ALLEN	New York City.
1st Vice-President,	J. H. MCQUILLEN	Philadelphia.
2d Vice-President,	WM. B. HURD	Brooklyn, N. Y.
Recording Secretary,	J. TAFT	Cincinnati.
Corresponding Secretary,	C. R. BUTLER	Cleveland.
Treasurer,	A. C. HAWES	New York City.

NIAGARA FALLS, JULY, 1864.

President,	J. H. MCQUILLEN	Philadelphia.
1st Vice-President,	C. P. FITCH	New York City.
2d Vice-President,	H. BENEDICT	Detroit.
Recording Secretary,	J. TAFT	Cincinnati.
Corresponding Secretary,	GEO. W. ELLIS	Philadelphia.
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CHICAGO, JULY, 1865.

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2d Vice-President,	JAS. MCMANUS	Hartford.
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Corresponding Secretary,	L. D. SHEPARD	Boston.
Treasurer,	I. J. WETHERBEE	Boston.

BOSTON, JULY, 1866.

President,	C. P. FITCH	New York City.
1st Vice-President,	W. H. MORGAN	Nashville.
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Corresponding Secretary,	A. HILL	Norwalk, Conn.
Treasurer,	W. W. SHEFFIELD	New London, Conn.

CINCINNATI, JULY, 1867.

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1st Vice-President,	P. G. C. HUNT	Indianapolis, Ind.
2d Vice-President,	A. S. TALBERT	Lexington, Ky.
Recording Secretary,	J. TAFT	Cincinnati.
Corresponding Secretary,	C. R. BUTLER	Cleveland.
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President,	JONATHAN TAFT	Cincinnati.
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Corresponding Secretary,	JAS. MCMANUS	Hartford.
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1st Vice-President,	S. W. DENNIS	San Francisco.
2d Vice-President,	J. R. WALKER	New Orleans.
Recording Secretary,	M. S. DEAN	Chicago.
Corresponding Secretary,	I. A. SALMON	Boston.
Treasurer,	W. H. GODDARD	Louisville.

* Owing to a change in the Constitution, officers elected at this and the sessions following served at the next annual meeting subsequent to their election and the sessions of and after 1869 commenced on the first Tuesday in August.

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2d Vice-President,	J. R. WALKER . . .	New Orleans.
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Corresponding Secretary,	J. TAFT	Cincinnati.
Treasurer,	W. H. GODDARD . . .	Louisville.

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Recording Secretary,	M. S. DEAN	Chicago.
Corresponding Secretary,	J. TAFT	Cincinnati.
Treasurer,	W. H. GODDARD . . .	Louisville.

DETROIT, AUGUST, 1874.

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Recording Secretary,	C. STODDARD SMITH . .	Springfield, Ill.
Corresponding Secretary,	GEO. L. FIELD . . .	Detroit.
Treasurer,	W. H. GODDARD . . .	Louisville.

NIAGARA FALLS, AUGUST, 1875.

President,	A. L. NORTHROP . . .	New York City.
1st Vice-President,	H. J. MCKELLOPS . . .	St. Louis.
2d Vice-President,	H. A. SMITH	Cincinnati.
Recording Secretary,	C. STODDARD SMITH . .	Springfield, Ill.
Corresponding Secretary,	J. H. MCQUILLEN . . .	Philadelphia.
Treasurer,	W. H. GODDARD . . .	Louisville.

PHILADELPHIA, AUGUST, 1876.

President,	GEO. W. KEELY . . .	Oxford, Ohio.
1st Vice-President,	C. N. PEIRCE . . .	Philadelphia.
2d Vice-President,	CORYDON PALMER . . .	New York City.
Recording Secretary,	C. STODDARD SMITH . .	Springfield, Ill.
Corresponding Secretary,	J. H. MCQUILLEN . . .	Philadelphia.
Treasurer,	W. H. GODDARD . . .	Louisville.

CHICAGO, AUGUST, 1877.

President,	F. H. REHWINKEL . .	Chillicothe, Ohio.
1st Vice-President,	L. D. SHEPARD . . .	Boston.
2d Vice-President,	GEO. T. BARKER . . .	Philadelphia.
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Corresponding Secretary,	M. H. WEBB	Lancaster, Pa.
Treasurer,	W. H. GODDARD . . .	Louisville.

NIAGARA FALLS, AUGUST, 1878.

President,	H. J. MCKELLOPS . . .	St. Louis.
1st Vice-President,	L. D. SHEPARD . . .	Boston.
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Corresponding Secretary,	A. O. RAWLS	Lexington, Ky.
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President,	L. D. SHEPARD . . .	Boston.
1st Vice-President,	C. N. PEIRCE . . .	Philadelphia.
2d Vice-President,	GEO. L. FIELD . . .	Detroit.
Recording Secretary,	GEO. H. CUSHING . . .	Chicago.
Corresponding Secretary,	M. H. WEBB	Lancaster, Pa.
Treasurer,	W. H. GODDARD . . .	Louisville.

BOSTON, AUGUST, 1880.

President,	C. N. PEIRCE . . .	Philadelphia.
1st Vice-President,	W. C. BARRETT . . .	Buffalo.
2d Vice-President,	GEO. J. FRIEDRICHS . .	New Orleans.
Recording Secretary,	GEO. H. CUSHING . . .	Chicago.
Corresponding Secretary,	A. M. DUDLEY . . .	Salem, Mass.
Treasurer,	W. H. GODDARD . . .	Louisville.

NEW YORK, JULY, 1881.

President,	H. A. SMITH	Cincinnati.
1st Vice-President,	W. C. BARRETT . . .	Buffalo.
2d Vice-President,	GEO. J. FRIEDRICHS . .	New Orleans.
Recording Secretary,	GEO. H. CUSHING . . .	Chicago.
Corresponding Secretary,	A. M. DUDLEY . . .	Salem, Mass.
Treasurer,	W. H. GODDARD . . .	Louisville.

CINCINNATI, AUGUST, 1882.

President,	W. H. GODDARD . . .	Louisville, Ky.
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Corresponding Secretary,	A. W. HARLAN . . .	Chicago.
Treasurer,	GEO. W. KEELY . . .	Oxford, Ohio.

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J. N. CROUSE, Chairman. A. M. DUDLEY, Secretary.

FIRST DIVISION—COMMITTEE OF ARRANGEMENTS.

FIELD, ODELL, AND MOORE.*

SECOND DIVISION—ON CREDENTIALS, ETHICS, AND AUDITING ACCOUNTS.

CROUSE, DUDLEY, AND PERRY.*

THIRD DIVISION—ON VOLUNTARY ESSAYS.

PEIRCE, MORGAN,* AND REHWINKEL.

LOCAL COMMITTEE OF ARRANGEMENTS.

W. C. BARRETT, Buffalo; C. R. BUTLER, Cleveland; G. L. FIELD, Detroit.

* These go out August, 1883.

CONTENTS.

	PAGE
Disclaimer	2
Officers from date of organization	3–7
Roll-call	13–16
Credential Committee's report	16
Publication Committee's report	17
Programme adopted	18
Time for election of officers fixed	18
Committee appointed to draft memorial of the late Dr. M. S. Dean	18
Motion of Dr. Barrett to extend the sympathies of the Association to Dr. M. H. Webb, and action thereon	18
Committee appointed to draft resolutions on the death of Dr. D. C. Hawxhurst	18
Amendment to the Constitution adopted	18
Reconsideration of vote adopting amendment to Constitution, and final action thereon	19
President's address referred to proper Sections	19
Motion of Dr. Watt to refer the report on Nomenclature to a special committee of five, and action thereon	19
Report of Committee to whom was referred the paper on Nomenclature	19, 20
Report and its adoption of Executive Committee auditing the report of the Publication Committee	20
Report of the Executive Committee auditing the Treasurer's report	20
Resolution requiring Treasurer to give bond	20
Motion extending the privileges of the floor	21
Report of Section IV.	21
Report of Committee on death of Dr. Hawxhurst	21
Motion to suspend the regular order to hear the memorial of Dr. M. S. Dean	22
Report of Committee on Voluntary Essays	22
Report of Section VII., with resolution to offer a prize	22
Organization of Sections	23
Report of Committee on Voluntary Essays, and action thereon	24, 25
Election of officers and selection of place of meeting	25
Instructions to Treasurer	25
Action on the resolution offered by Section VII.	25
Special Committee appointed, as provided for by above resolution	26

Report of Section I. 26
Motion requesting Dr. Dorrance to secure the manufacture of his blow-pipe 26
Motion fixing time to install officers 26
Motion of Dr. Crouse to appropriate money 26
Installation of officers 27
Remarks of newly-elected President 27
Motion of Dr. Crouse to reconsider the vote appropriating money . . 27
Motion of Dr. Peirce, limiting speakers to five minutes 27
Local Committee of Arrangements appointed 28
Publication Committee appointed 28
Instructions to Publication Committee 28
Vote of thanks 28
Resolution of Dr. Noel on College Association 28
Adoption of Executive Committee's Report auditing Treasurer's account . 28
Notices of amendment to Constitution 28, 29
Memorial pages 30–33
Standing Resolutions 161, 162

REPORTS AND VOLUNTARY PAPERS.

Address of Welcome, by Dr. A. Berry 34
President's Annual Address 37

Section IV.

Paper on Regulating Teeth, by W. N. Morrison 43

Section VI.

Paper on Treatment of Pulpless Teeth, by A. O. Rawls 60
Paper on Diatheses and Cachexiæ, by F. M. Odell 65
Paper on Hydrogen Dioxide, by A. W. Harlan 70

Section VII.

Paper on Origin of Nervous Force, by W. C. Barrett 94

Section I.

Paper on Celluloid, by T. L. Buckingham 108
Paper on Ill Results of Plastic Bases, by W. H. Dorrance 112

Section III.

Report on Nomenclature, by W. H. Atkinson 122
Report on Dental Literature, by J. Taft 131

Section II.

Report on Education, by J. N. Crouse 139

VOLUNTARY PAPER.

Paper on Reflex Lesions of the Oral Cavity Associated with Pregnancy, by Joseph Richardson 156

DISCUSSIONS.

SECTION IV.

Operative Dentistry—discussed by
Dr. Atkinson 46, 47
Dr. Peirce 46, 57
Dr. Shepard 47, 50
Dr. McKellops 47, 58
Dr. Noel 50
Dr. Field 51
Dr. Darby 51
Dr. Eames 52, 58
Dr. Butler 53
Dr. Dorrance 54
Dr. Keeley 54, 57
Dr. Crouse 58
Dr. Marcklein 58, 59
Dr. Thomas 59
Dr. Morrison 59

SECTION VI.

Papers presented—discussed by
Prof. Mayr 78, 90
Dr. Rawls 73, 77
Dr. Ingersoll 74, 76, 77, 80
Dr. Peirce 76, 77
Dr. Friedrichs 77, 83, 84, 86, 87
Dr. Morgan 77, 82
Dr. Watt 79, 80, 85, 86, 87, 88, 89, 90
Dr. Thomas 80
Dr. Buckingham 81, 85, 86, 91, 98
Dr. Atkinson 82, 84, 86, 89, 91
Dr. Kulp 87
Dr. Odell 87, 89
Dr. Darby 90, 91
Dr. Allport 92, 98

SECTION VII.

The Origin of Nervous Force—discussed by
Dr. Buckingham 107

SECTION I.

Artificial Dentistry—discussed by
Dr. Horton 117, 118
Dr. Buckingham 117, 118, 121
Dr. Hurtt 118, 119, 120, 121
Dr. Morrison 118
Dr. Atkinson 118
Dr. Robinson 119
Dr. Thomas 120

SECTION III.

Dental Literature—discussed by
Prof. Mayr 137

SECTION II.

Dental Education—discussed by
Dr. Robinson 141, 155
Dr. Atkinson 141
Dr. Peirce 142
Dr. Barrett 142
Dr. Taft 143
Dr. Allport 144, 153
Dr. Buckingham 147, 155
Dr. Morgan 147, 153, 155
Dr. Brophy 150
Dr. Kulp 152
Dr. E. Hunter 154

MINUTES OF TRANSACTIONS

OF THE

AMERICAN DENTAL ASSOCIATION.

SESSION OF 1882.

BY GEO. H. CUSHING, SECRETARY.

FIRST DAY—MORNING SESSION.

THE AMERICAN DENTAL ASSOCIATION commenced its twenty-second Annual Session at Highland Hall, Cincinnati, Tuesday, August 1, 1882, at 11.30 A.M., the President, H. A. Smith, in the Chair.

The session was opened with prayer by Dr. W. H. Morgan.

The roll of qualified members was then called, and the following were found either to be present or to have forwarded their dues:

ALLPORT, W. W.	240 Wabash ave., Chicago, Ill.
ATKINSON, W. H.	41 East Ninth st., New York.
d ARTHUR, H. W.	191 Penn ave., Pittsburg, Pa.
BETTY, E. G.	126 West Ninth st., Cincinnati, O.
BAUER, JOSEPH	180 Esplanade st., New Orleans, La.
BOGER, J. H.	Findlay, Ohio.
BROWN, SEN. B.	Fort Wayne, Ind.
BROWN, IRA	Cleveland, Ohio.
BARRETT, W. C.	11 West Chippewa st., Buffalo, N. Y.
BUCKINGHAM, T. L.	1228 Arch st., Philadelphia, Pa.
* BRACKETT, C. A.	Newport, R. I.
BUTLER, C. R.	519 Euclid ave., Cleveland, Ohio.
* BROCKWAY, A. H.	18 Greene ave., Brooklyn, N. Y.
BROPHY, T. W.	State and Madison sts., Chicago, Ill.
CROUSE, J. N.	2101 Michigan ave., Chicago, Ill.
CUSHING, GEORGE H.	84 Monroe st., Chicago, Ill.

Those marked [*] were absent but sent their dues.
Those marked thus [*d*] were Delegates.

* Coolidge, J. B.	Boston, Mass.
Cleland, James	Detroit, Mich.
Cowie, Henry	Detroit, Mich.
Callahan, J. R.	Hillsboro, Ohio.
d Cormany, J. W.	Mt. Carroll, Ill.
* Chaim, M. L.	30 Cooper Institute, New York.
* Colton, A.	Hudson, N. Y.
d Cravens, J. E.	Indianapolis, Ind.
d Canine, C. E.	Fifth st., Louisville, Ky.
Clayton, John R.	Shelbyville, Ind.
d Cameron, W. H.	Cincinnati, Ohio.
Clancey, D. W.	Cincinnati, Ohio.
* Colgrove, W. H.	41 Market st., Johnstown, N. Y.
Dudley, A. M.	228 Essex st., Salem, Mass.
Darby, E. T.	1513 Walnut st., Philadelphia, Pa.
Davis, K. B.	Springfield, Ill.
Dorrance, W. H.	Ann Arbor, Mich.
Dunn, Charles E.	Second st., Louisville, Ky.
* Davenport, S. E.	127 West Thirty-fourth st., New York.
Evans, W. W.	1756 M st., Washington, D. C.
d Eames, W. H.	2930 Washington ave., St. Louis, Mo.
Emminger, A. F.	18 East Broad st., Columbus, O.
Field, George L.	Detroit, Mich.
Friedrichs, Geo. J.	155 St. Charles st., New Orleans, La.
Fundenburg, W. H.	323 Penn ave., Pittsburg, Pa.
Finley, M. F.	Washington, D. C.
French, Gale	Pittsburg, Pa.
d Fuller, A. H.	2626 Washington ave., St. Louis, Mo.
* Farrar, J. N.	15 Greene ave., Brooklyn, N. Y.
d Freeman, R. R.	Nashville, Tenn.
Freeman, A. W.	126 State st., Chicago, Ill.
Goddard, Wm. H.	Louisville, Ky.
Garber, S. A.	Tipton, Iowa.
d Garnett, W. M.	Glasgow, Ky.
* Gaylord, E. S.	152 Chapel st., New Haven, Conn.
Hunt, P. G. C.	Indianapolis, Ind.
Hurtt, J. M.	Peoria, Ill.
Harlan, A. W.	70 Dearborn st., Chicago.
Harroun, C. H.	Toledo, Ohio.
* Hill, J. L.	Gettysburg, Pa.
How, W. S.	Cincinnati, Ohio.
d Horton, W. P.	Cleveland, Ohio.
Harper, J. G.	St. Louis, Mo.
Hunter, F. A.	123 West Seventh st., Cincinnati, Ohio.
Heise, O. N.	Cincinnati, Ohio.
Hooper, J.	Louisville, Ky.
Hunter, E.	Jackson, Mich.
Ingersoll, L. C.	Keokuk, Iowa.

d JAMES, C. H.	Cincinnati, Ohio.
KEMPTON, W. D.	Cor. Liberty and Freeman sts., Cincin., O.
* KNOWLES, S. E.	San Francisco, Cal.
KEELY, GEO. W.	Oxford, Ohio.
KEELY, C. I.	Oxford, Ohio.
KULP, W. O.	Davenport, Iowa.
KEITH, H. H.	615 Olive st., St. Louis, Mo.
KLUMP, G. W.	Williamsport, Pa.
LATHROP, JOSEPH	152 Woodward ave., Detroit, Mich.
d LEITER, T. C.	Wadsworth, Medina Co., Ohio.
* MOORE, T. T.	Columbia, S. C.
MCKELLOPS, H. J.	2630 Washington ave., St. Louis, Mo.
MORRISON, W. N.	1337 Washington ave., St. Louis, Mo.
MORGAN, W. H.	Nashville, Tenn.
MARCKLEIN, B. G.	Room 2, Iron Block, Milwaukee, Wis.
* MCMANUS, JAMES	Hartford, Conn.
MOORE, E. C.	22 Lafayette ave., Detroit, Mich.
d MORGAN, R. C.	Lancaster, Ky.
MORGAN, HENRY W.	Nashville, Tenn.
d MORRISON, JOHN B.	Indianapolis, Ind.
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NOEL, L. G.	238½ Church st., Nashville, Tenn.
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RAWLS, A. O.	Lexington, Ky.
ROBINSON, J. A.	Jackson, Mich.
REHWINKEL, F. H.	Chillicothe, Ohio.
RHEIN, M. L.	New York City.
d ROSE, A. G.	Cincinnati, Ohio.
* STARBUCK, W. C.	Jamaica Plain, Mass.
SHEPARD, L. D.	100 Boylston st., Boston, Mass.
* STOCKTON, C. S.	Newark, N. J.
d SMITH, G. W.	Fourth and Smith sts., Cincinnati, Ohio.
SMITH, H. A.	Cincinnati, Ohio.
SHEPARD, GEO. L.	Sedalia, Mo.
SMITH, A. WILKES	Richmond, Ky.
STEWART, S. D.	Akron, Ohio.
* SMITH, E. H.	Boston, Mass.
TAFT, J.	Cincinnati, Ohio.
TRUEMAN, W. H.	900 Spruce st., Philadelphia, Pa.
THOMAS, GEO. R.	Detroit, Mich.
TEMPLETON, J. G.	Pittsburg, Pa.
* TILLINGHAST, W. H.	220 Westminster st., Providence, R. I.
d WATT, GEO.	Xenia, Ohio.

d WALDRON, F. H. . . .	Canal Dover, Ohio.
WATLING, J. A.	Ypsilanti, Mich.
WENDEL, W. D.	Room 2, Iron Block, Milwaukee, Wis.
WRIGHT, C. M.	280 West Seventh st., Cincinnati, Ohio.
WILLIAMS, I.	New Philadelphia, Ohio.
WILSON, GEO. H. . . .	Painesville, Ohio.
WILSON, I. P.	Burlington, Iowa.
d WELLS, GRAHAM A. . . .	Indianapolis, Ind.
* WERNER, J. G. W. . . .	Upton st., Boston, Mass.

The following sent their dues:

CLEMENTS, C. W., for 1881, . .	Manchester, N. H.
WILSON, C. P., for 1881, (withdrawn)	Boston, Mass.
RICHTER, R. G., for 1880–81, .	Milwaukee, Wis.
KITCHEN, C. A., for 1881, . .	Rockford, Ill.

An address of welcome was then delivered by Dr. A. Berry, of Cincinnati, which was responded to by Dr. W. C. Barrett, of Buffalo.

On motion, the reading of the printed minutes was dispensed with.

The Committee on Credentials made a partial report, which was subsequently completed as follows:

Cincinnati Dental Society—C. M. Wright, A. G. Rose, G. W. Smith, O. N. Heise, W. Hart Cameron.

Chicago Dental Society—J. N. Crouse.

Detroit Dental Society—Henry Cowie.

Harvard Odontological Society—Horatio C. Meriam.

Illinois State Dental Society—A. W. Harlan, George H. Cushing, John M. Hurtt, K. B. Davis, James W. Cormany, D. J. Pollock, T. W. Brophy.

Indiana State Dental Association—Seneca B. Brown, P. G. C. Hunt, G. F. Nevins, J. E. Cravens, John R. Clayton, John B. Morrison, Graham A. Wells.

Iowa State Dental Society—L. C. Ingersoll, I. P. Wilson, S. A. Garber, W. O. Kulp.

Kentucky State Dental Association—R. C. Morgan, W. H. Goddard, C. E. Canine, A Wilkes Smith, W. M. Garnett, C. E. Dunn.

Michigan State Dental Association—George R. Thomas, W. H. Dorrance, E. C. Moore, J. A. Robinson.

Mississippi Valley Association of Dental Surgeons—W. D. Kempton, J. R. Callahan, Otto Arnold.

Missouri State Dental Association—John G. Harper, A. H. Fuller, George L. Shepard, W. H. Eames.

New Orleans Odontological Society—George J. Friedrichs, Joseph Bauer.

Northern Ohio Dental Association—T. C. Leiter, Frank H. Waldron, Gale French, J. G. Templeton.

Odontological Society of Western Pennsylvania—H. W. Arthur.

Ohio State Dental Society—E. G. Betty, J. H. Boger, Ira Brown, C. H. James, George Watt, W. P. Horton, I. Williams, C. I. Keely.

Pennsylvania State Dental Society—C. N. Peirce, E. T. Darby.

Pennsylvania Association of Dental Surgeons—W. H. Trueman, T. L. Buckingham.

Pittsburg Dental Association—W. H. Fundenburg.

St. Louis Dental Society—W. N. Morrison.

Tennessee Dental Association—H. W. Morgan, R. R. Freeman.

Washington City Dental Society—W. Warrington Evans.

Wisconsin State Dental Society—W. D. Wendel, B. G. Marcklein.

The report of the Publication Committee was then read, as follows:

The Publication Committee would respectfully submit the following report:

In accordance with the instructions of the Association, they perfected arrangements with The S. S. White Dental Manufacturing Company, whereby the Transactions were furnished free of cost to the Association.

Copies of the Transactions have been furnished to all members entitled to them, and to the various libraries, universities, journals, and honorary members, leaving in the hands of the Secretary about thirty copies.

The committee also had printed five hundred copies of the Constitution.

The late date at which the Transactions were distributed was owing to circumstances which your committee could not control. The stenographer, owing to sickness, did not furnish a copy of the discussions until three months had elapsed after the meeting in New York, and after the copy was placed in the hands of the publishers, great delay attended the progress of the work, and the Transactions were only received by the committee on June 7th, on which day they were mailed to the members.

The following is the account of the committee with the Association:

Received of the Treasurer		$75 00
From sale of Transactions		2 00
		$77 00
Expended for postage	$25 00	
" " Constitutions	18 00	
" " postal cards and printing	5 50	
" " packing boxes	5 50	
" " valise for papers	5 75	
" " copying, stationery, expressage, etc	20 15	$79 90
Balance due the Committee		$2 90

Respectfully,

GEORGE H. CUSHING, *Chairman.*

CINCINNATI, August 1, 1882.

We have examined the within report and found it correct.

J. N. CROUSE,
EDWIN T. DARBY, } *Ex. Com.*

On motion, the programme offered by the Local Committee, with slight amendments, was adopted.

On motion, the time for selecting the next place of meeting, the election of officers, and the organization of Sections, was made the special order of business for 2 o'clock P.M., Thursday.

On motion of Dr. Crouse, the following committee was appointed to draft a memorial respecting the death of Dr. M. S. Dean: Drs. J. N. Crouse, C. N. Peirce, and L. D. Shepard.

On motion of Dr. Barrett, the Secretary was instructed to extend, by telegraph, the sympathies of the Association to Dr. M. H. Webb, now lying seriously ill at his home in Lancaster, Pa.

In accordance with these instructions, the following telegram was forwarded:

"The American Dental Association extends its sympathies to Dr. M. H. Webb in his present sufferings, with the warm and confident hope that he may be with this Association again, in his wonted health, at its next annual meeting."

On motion of Dr. Field, the following committee was appointed to draft resolutions on the death of Dr. D. C. Hawxhurst: Drs. George L. Field, T. L. Buckingham, and J. Taft.

The amendment to the Constitution offered last year by Dr. Shepard, was then adopted, as follows:

To amend Article IV. of the Constitution, so as to make the present Article, Section 1 of Article IV., and to add a section as follows:

SEC. 2. The officers may, for extraordinary reasons, change the time and place of meeting upon the written consent of (10) ten of the (15) fifteen officers.

On motion, adjourned till 2 P.M.

FIRST DAY—AFTERNOON SESSION.

The Association was called to order at 2.30 P.M., President Smith in the Chair.

The minutes of the morning session were then read and approved, after which the President read his annual address.

On motion of Dr. Shepard, the vote taken this morning adopting the amendment to the Constitution was reconsidered.

Dr. Shepard moved that the amendment proposed be changed to read:

"The officers may, for extraordinary reasons, by giving at least thirty days' notice to each member, change the time and place of meeting upon the written consent of (10) ten of the (15) fifteen officers."

The President ruled the amendment out of order. The question then recurred on the original amendment as adopted this morning, when it was again adopted.

On motion of Dr. Morgan, so much of the President's address as referred to etiology and to education, was referred to the proper Sections.

Sections IV., V., VI., VII., I., and II., were called in the order named, but none were ready to report.

Section III. was called, and a report on Nomenclature and Terminology was read by W. H. Atkinson, chairman of the Section.

Dr. Watt moved that the report on Nomenclature be referred to a special committee of five, of which the mover should not be one.

Discussed by Drs. Rehwinkel, Watt, Robinson, and E. Hunter.

Dr. Crouse moved to lay Dr. Watt's motion on the table. This was lost.

Dr. Watt's motion was further discussed by Drs. Horton, Shepard Crouse, and Watt.

The motion was then put and was adopted.

The Chair appointed as that committee, Drs. C. N. Peirce, George J. Friedrichs, F. M. Odell, F. H. Rehwinkel, and George W. Keely.

The committee subsequently reported the following:

The special committee to whom was referred a paper on Philology, read by Dr

W. H. Atkinson as chairman of the Section on Dental Literature and Nomenclature, would respectfully report, that they have carefully considered the subject referred to them, and are of the opinion that the paper under consideration is foreign to the purpose of the Section under which it was read, and that if the Association desire further communications upon general philology, a Section of that title should be created; but in view of the fact that, at previous meetings of this Association, similar papers have been received without adverse criticism, they would suggest that this one be allowed to take the usual course, and go with other reports to the Publication Committee.

(Signed) C. N. PEIRCE, *Chairman.*
F. H. REHWINKEL,
GEORGE J. FRIEDRICHS,
GEORGE W. KEELY,
FRANK M. ODELL.

The report on Literature was not ready.

The Committee on Credentials made a supplementary report.

The Executive Committee reported that they had audited the report of the Publication Committee and found it correct. Their report was adopted. They also reported that they had audited the Treasurer's report and found it correct.

On motion, adjourned.

SECOND DAY—MORNING SESSION.

The Association met at 9.30 A.M., President Smith in the Chair.

The minutes of the afternoon session were read and approved.

Dr. Goddard offered the following:

Resolved, That from and after this date, the Treasurer of this Association shall be required to give such bonds for the faithful discharge of the duties devolving upon his office, as the second division of the Executive Committee may deem necessary, and his predecessor shall not surrender the funds, books, or papers, until he is informed by said Executive Committee that such bonds have been executed.

This was adopted.

On motion, the privileges of the floor were accorded to Prof. Mayr, of Springfield, Mass., and to Prof. Stubblefield, of Nashville.

Section IV. being called, submitted the following brief report:

Section IV. regrets that it has but one paper to present, the subject of which is, "Some Thoughts on Regulating Teeth," which it recommends should be read. The Section would also bring before the Association Dr. Coffin's method of treating irregularities of the teeth by the use of rubber plates and piano-wire, which will be thoroughly described by a member of the Section; and would also suggest the desirability of a thorough discussion of the various new methods of ingrafting artificial crowns upon natural roots.

EDWIN T. DARBY, *Chairman.*

A paper on irregularities was then read by W. N. Morrison, of St. Louis, and the subject was discussed by Drs. Atkinson, Peirce, Shepard, Darby, McKellops, Noel, Field, Eames, Butler, Dorrance, Keely, Crouse, Marcklein, and Morrison.

Adjourned till 1.30 P.M.

SECOND DAY—AFTERNOON SESSION.

The Association was called to order at 2 P.M., President Smith in the Chair.

The minutes of the morning session were read and approved.

The committee appointed to draft resolutions respecting the death of Dr. Hawxhurst made their report, which was adopted, and will be found in the memorial pages.

Section VI. being called, a paper was read by Dr. A. O. Rawls on Pathology, and one by A. W. Harlan, on Therapeutics. They were discussed by Prof. Mayr and Drs. Ingersoll, Peirce, Friedrichs, Morgan, Rawls, Watt, Buckingham, and Atkinson.

Adjourned till 9 o'clock to-morrow.

THIRD DAY—MORNING SESSION.

The Association met at 9.30 A.M., the President, Dr. Smith. in the Chair.

The minutes of the afternoon session were read and approved.

The consideration of subjects in Section VI. was then resumed, and a paper on "Diatheses and Cachexiæ" was read by Dr. F. M. Odell, chairman of the Section.

This was discussed by Drs. Atkinson, Friedrichs, Buckingham, Watt, Kulp, Odell, Prof. Mayr, and Drs. Darby and Thomas.

Section VI. was passed.

On motion, the regular order was suspended, and the committee appointed to draft a memorial touching the death of Dr. M. S. Dean made their report, which was unanimously adopted, and will be found in the memorial pages.

The Committee on Voluntary Essays reported, recommending that the paper which had been placed in their hands be not read. The report was adopted.

They further reported that another paper had just now been placed in their hands, upon which they were not ready to report. They were granted further time.

Section VII. being called, made the following report:

Section VII. begs leave to report that but one paper has been presented to the Section, which they recommend be read to the Association. The paper is by W. C. Barrett, of Buffalo, and is entitled: "The Origin and Physiology of Nervous Force."

With reference to that part of the President's address on the subject of Etiology which was referred to it, the Section, in accordance with the suggestion of the President, begs leave to offer the following resolution:

Resolved, That the sum of two hundred dollars be set apart to be awarded by a special committee of three members of this Association to be appointed by the President, to the author of the best paper upon the Etiology of Dental Caries, the paper to be based upon strictly original investigation, and to be presented to this Association in the report of Section VII.

Said committee shall prescribe the conditions upon which essays shall be presented, and in case two or more papers of equal claims to merit shall come before them they may in their discretion divide the sum so set apart and award a portion to each essayist. Unless papers of sufficiently original merit be submitted, the committee may decline to award the prize, and hold it over until, in their opinion,

it has been fairly earned. The competitors for this prize need not be members of this Association, but the profession of the world is invited to the consideration of the subject.

(Signed) W. C. BARRETT, *Chairman*,
E. HUNTER, *Secretary*.

The paper by Dr. Barrett was then read and was discussed by Dr. Buckingham.

The organization of Sections then took place, as follows:—

SECTION I. Artificial Dentistry, Chemistry, and Metallurgy.—T. L. Buckingham, Chairman; J. G. Harper, Secretary; C. S. Stockton, W. H. Fundenburg, W. H. Dorrance, C. H. Harroun, H. H. Keith, D. D. Smith, J. Hooper, C. E. Canine, D. S. Dickerman, George L. Shepard, A. G. Rose, Charles E. Dunn, E. Honsinger, Wm. H. Trueman, I. Douglass, J. C. Whinery, Thomas H. Chandler, S. A. Garber, John Allen, W. W. Evans, J. F. Adams, L. L. Buckland, J. E. Blake, C. Bullock, Eben M. Flagg, Lyman C. Bryan, Jacob H. Boger, C. W. Clements, C. C. Carroll, Geo. F. Grant, Jas. Cleland, W. P. Church, E. S. Holmes, S. M. Cummings, H. W. Coburn, F. A. Hunter, J. O. Cook, M. L. Chaim, O. N. Heise, E. B. Davis, Miles H. Dodge, O. F. Harris.

SECTION II. Dental Education.—L. D. Shepard, Chairman; T. W. Brophy, Secretary; J. N. Crouse, C. N. Peirce, J. E. Lyman, J. G. Templeton, John M. Hurtt, N. Morgan, K. B. Davis, W. W. Allport, C. W. Meloney, W. N. Morrison, W. H. Morgan, W. E. Magill, George R. Thomas, P. G. C. Hunt, D. C. McNaughton, C. M. Wright, C. J. Essig, S. J. McDougall, Chas. H. Osgood, Wm. Barker, J. I. McCampbell, Thos. Fillebrown, C. D. Cook, J. T. McMillen, A. Colton, S. W. Dennis, H. B. Noble, P. K. Filbert, A. W. Freeman, E. S. Talbot, S. A. Freeman, G. A. Gerry, W. M. Garnett, D. B. Ingalls, W. H. Jones, H. H. Jackson, G. W. Klump, C. A. Kitchen, S. E. Knowles, D. C. Kelly, W. B. Knapp, Jos. Lathrop.

SECTION III. Dental Literature and Nomenclature.—J. Taft, Chairman; F. H. Rehwinkel, Secretary; Geo. J. Friedrichs, W. H. Atkinson, C. A. Kingsbury, Seneca B. Brown, W. A. Bronson, Chas. E. Francis, J. L. Hill, George A. Mills, Thos. T. Moore, Chas. Merritt, W. S. Moses, A. L. Northrop, E. Osmond, Jas. G. Palmer, Edgar Palmer, J. A. Robinson.

SECTION IV. Operative Dentistry. — E. T. Darby, Chairman; H. J. McKellops, Secretary; E. G. Betty, W. D. Kempton, C. I. Keely, Geo. L. Field, W. O. Kulp, Gale French, I. P. Wilson, G. F. Nevins, I. Brown, B. G. Marcklein, G. W. Smith, J. W. Cormany, W. H. Goddard, M. F. Finley, G. W. Keely, Geo. H. Wilson, H. C. Meriam, W. D. Wendel, J. A. Watling, J. R. Clayton, F. H. Waldron, E. C. Moore, E. S. Gaylord, W. C. Starbuck, S. G. Stevens, J. N. Farrar, W. E. Page, C. W. Partridge, G. B. McDonald, Jas. McManus, I. Williams, J. R. Callahan, J. B. Coolidge, R. G. Richter, H. K. Leech, S. B. Palmer, G. A. Young, L. G. Noel, H. M. Ambler, D. F. Whitten, Chas. F. Allan, Jos. Bauer, C. A. Woodward, R. W. Browne, H. A. Baker, Geo. S. Meigs,

A. N. Priest, A. L. Pettee, J. Frank Marriner, C. B. Parker, D. J. Pollock, F. J. Richards, S. G. Perry, E. A. Bogue, J. W. Rhone, Chas. R. Butler, G. Carleton Brown, J. H. Smith, A. H. Brockway, D. M. Clapp, T. C. Stellwagen, J. F. Canine, D. W. Clancey, J. A. Swasey, Wm. Dutch, G. C. Daboll, F. N. Seabury, A. F. Emminger, A. H. Fuller, S. D. Stewart, R. R. Freeman, S. H. Guilford, E. H. Smith, J. S. Hurlbut, G. W. Hoysradt, C. S. Hurlbut, Robt. Huey, E. D. Swain, Wm. Jarvie, Jr., Benj. Lord, W. H. Tillinghast, W. T. LaRoche, W. P. Leavitt, M. V. Toledo, J. E. Lyman, J. U. Lee, M. H. Webb.

SECTION V. Anatomy, Histology, and Microscopy.—Geo. H. Cushing, Chairman; Frank Abbott, Geo. F. Waters, S. E. Davenport, R. R. Andrews, Chas. P. Pruyne, J. Adams Bishop, M. L. Rhein, I. B. Davenport, C. F. W. Bödecker, A. W. Buckland, R. W. Tenney.

SECTION VI. Pathology, Therapeutics, and Materia Medica.—F. M. Odell, Chairman; A. M. Dudley, Secretary; A. W. Harlan, A. O. Rawls, Otto Arnold, L. C. Ingersoll, Wm. Taft, W. H. Colgrove, C. A. Brackett, Wilbur F. Litch, C. S. Beck, S. C. G. Watkins.

SECTION VII. Physiology and Etiology.—W. C. Barrett, Chairman; W. P. Horton, Secretary; H. A. Smith, E. Hunter, A. Wilkes Smith, W. Storer Howe, Henry W. Morgan, Leon Rideout, Flavius Searle, E. S. Niles, J. G. W. Werner, C. T. Stockwell.

Adjourned till 2 P.M.

THIRD DAY—AFTERNOON SESSION.

The Association met at 2 P.M., the President in the Chair.

The minutes of the morning session were read and approved.

The Committee on Voluntary Essays made the following report, which was adopted:

Your Committee on Voluntary Essays to whom was referred the paper of Dr. Jos. Richardson—on "Reflex Lesions of the Oral Cavity Associated with Pregnancy," would respectfully report that the communication is one of merit and worthy of consideration by this Association, but as the author is not a member, they decline to make any recommendation respecting its being read, preferring to report the paper back to the Association for its decision upon its presentation.

Signed by

Committee, { C. N. PEIRCE, *Chairman*, W. H. MORGAN, F. H. REHWINKEL.

Dr. Buckingham moved that the paper be read.

Dr. Crouse offered as an amendment, that the paper be *not* read until after the Sections have reported.

The motion as amended was adopted.

The special order being now called, the Association proceeded to ballot for the place of next meeting. Niagara Falls was chosen.

Balloting for officers then followed, resulting in the election of the following:

President—W. H. Goddard, of Louisville, Ky.
First Vice-President—George J. Friedrichs, of New Orleans, La.
Second Vice-President—E. T. Darby, of Philadelphia.
Corresponding Secretary—A. W. Harlan, of Chicago.
Recording Secretary—Geo. H. Cushing, of Chicago.
Treasurer—Geo. W. Keely, of Oxford, Ohio.
Executive Committee—J. N. Crouse, A. M. Dudley, Geo. L. Field.

Adjourned till to-morrow at 9 A.M.

FOURTH DAY—MORNING SESSION.

The Association was called to order at 9.30, the President, Dr. Smith, in the Chair.

The minutes of the afternoon session were read and approved.

On motion, the Treasurer was instructed to pay all properly authenticated bills, and to notify all members in arrears.

The regular order being resumed, the consideration of Section VII. was continued. Discussed by Dr. Barrett.

On motion, the resolution submitted by Section VII., offering a prize for the best essay on the Etiology of Dental Caries, was adopted.

Dr. Atkinson moved that the blank in the resolution just adopted be filled by naming the sum of five hundred dollars.

Dr. Taft offered an amendment substituting two hundred dollars.

The mover accepted the amendment, and as amended the motion prevailed.

The President appointed as the special committee called for by the above resolution, Drs. C. N. Peirce, W. A. Bronson, and E. T. Darby.

Section VII. was passed.

Section I. being called made the following report:

Section I. would respectfully report that they suggest to this body for its consideration a paper on Celluloid, by the chairman, Dr. Buckingham, of Philadelphia. They would also call attention to a material for filling teeth presented by Dr. Robinson, of Michigan, to a material known as Reese's metallic base for artificial teeth, presented by Dr. Atkinson, of New York, and to a formula for an alloy for making solder, and a blow-pipe, presented by Dr. Dorrance, of Michigan.

(Signed) T. L. BUCKINGHAM, *Chairman.*

The paper by Dr. Buckingham was then read, and discussed by Drs. Atkinson, Buckingham, Robinson, and Hurtt. A paper on the ill effects of plastic bases, by Dr. Dorrance, was then read.

On motion, Dr. Dorrance was requested to secure the manufacture of his blow-pipes to enable the profession to obtain them.

Section I. was passed.

On motion it was voted to install the newly-elected officers immediately after convening this afternoon.

Dr. Crouse moved that the sum of three hundred dollars be appropriated from the treasury, to be expended at the discretion of a committee to be appointed, for the purpose of securing the scientific tabulation of the skulls of the various collections held in this country. Carried.

Adjourned till 2 P.M.

FOURTH DAY—AFTERNOON SESSION.

The Association met at 2.15 P.M., the President in the Chair.

The minutes of the morning session were read and approved.

The newly-elected President, Dr. W. H. Goddard, was then installed and made the following remarks:

GENTLEMEN,—Having been elected very unexpectedly, and without solicitation, to the Presidency of this body—a position the highest in the gift of my professional brethren to bestow—I feel constrained at the outset to say that while I appreciate and am grateful for the honor conferred, I doubt my ability to discharge the duties incumbent upon the office.

The presiding officer of such an intelligent and scientific body as the American Dental Association should have great executive ability as well as a thorough familiarity with parliamentary practice,—qualities which I fear I do not possess.

But we live in a progressive age, our watchword being "onward and upward," and so we all strive, I hope, to attain the good things not yet our own.

I have confidence that the same courtesy and assistance I have always received from the members of this Association in the discharge of the duties of my late office, will be extended to me in the discharge of those now devolving on me, and whatever errors I may commit will be "of the head, not of the heart."

Inviting, then, the same co-operation and assistance as heretofore, and trusting that the good angels will hover above and about me, inciting and inspiring me to every good work and effort, I cordially thank you for the honor conferred, and assume the gavel with an earnest and, I trust, not unreasonable hope of success.

Dr. Crouse moved a reconsideration of the vote of this morning appropriating three hundred dollars for tabulating skulls. Carried.

The question being put again on the original motion to appropriate was lost.

Section III. being again called, Dr. Taft read a paper on Literature. Discussed by Prof. Mayr.

Section II. was then called, and a report was made by Dr. Crouse, the chairman.

On motion of Dr. Peirce, the following was adopted:

Resolved, That during the consideration of the subject of Dental Education, the speakers shall be limited to five minutes, and no one shall speak more than once, without unanimous consent, until all who wish to speak have spoken.

Education was then discussed by Drs. Robinson, Atkinson, Peirce, Barrett, Taft, Allport, Buckingham, Morgan, Brophy, Kulp, and Hunter.

The subject was passed, and miscellaneous business taken up.

The Committee on Credentials made their final report, which was adopted.

The President appointed as the Local Committee of Arrangements Drs. Barrett, Butler, and Field.

Also on Publication Committee, Drs. Darby, of Philadelphia, and Harlan, of Chicago.

On motion of Dr. Peirce, the following was adopted:

Resolved, That the Publication Committee be and are hereby authorized to use their discretion in the matter of printing the Transactions, under the instructions given them by the resolution passed at Boston in 1880. Also,

Resolved, That the thanks of this Association be and are hereby tendered to such of the press and reporters as have properly reported us, to the officers of this Association, to the Local Committee, and to the resident professional gentlemen and citizens who have contributed to our pleasure and comfort during the sessions of this body; also to such of the railroad companies as have honored their obligations in accordance with the agreements made with the Local Committee of Arrangements.

Prof. Stubblefield, of Vanderbilt University, Tennessee, was introduced, and made a few remarks.

On motion of Dr. Taft, the thanks of the Association were tendered to Mr. Harff, the proprietor of Highland Hall, for his generous donation of its use to the Association, and for the many services rendered in various ways.

The following, offered by Dr. Noel, was referred to the Section on Education, they to report on it next year:

Resolved, That this Association recommends to the various dental colleges of this country, the organization of an association of colleges for the purpose of securing concerted action as to what shall be required of students, both upon entering and leaving those institutions; and that in case such an association is formed, no college refusing to abide by the action of the College Association shall be recognized by the American Dental Association

The report of the Executive Committee auditing the Treasurer's report was adopted.

The following notice of amendment to the Constitution was filed:

"All resolutions appropriating money, except for the legitimate expenses of this Association, shall require a two-thirds vote of all the members present."

The minutes were then read and approved, and the Association adjourned to meet at Niagara Falls on the first Tuesday in August, 1883.

Notice of amendment to the Constitution offered by Dr. Allport.

To amend Article V. Section 1, as follows: On line *four*, after the words "Executive Committee," strike out all the remaining section, and insert "All candidates for office shall be put in nomination by a committee appointed for that purpose, consisting of one member from each Section of the Association appointed by such Section, who shall put in nomination three candidates for each office of the Association. When the nominations are made, the election shall be by ballot in the order named in the Constitution. In case no candidate receives a majority of all the votes on the first ballot, the candidate receiving the lowest number of votes shall be dropped, and the ballot shall be taken upon the two remaining candidates, and the one receiving a majority of the votes shall be declared elected."

[The above was handed to the Secretary too late to appear in its proper place in the minutes.]

IN MEMORIAM.

M. S. DEAN.

In the uncertainty of life we are called upon to record the death of our beloved friend, brother, and associate, Dr. M. S. Dean, of Chicago. In this sad bereavement we have lost the companionship of one who was original and progressive in thought, though calm and conservative in action, and just and charitable in expressing his convictions. Possessing keen perceptions, delicate sensibilities, and refined tastes, he was pure, warm-hearted, and sympathetic in nature; genial, humorous, witty, and at times even boyish and exuberant in spirits. With these attributes governing his life, he enjoyed to an unusual degree the confidence and affection of his associates, while with those who had the good fortune to be his personal friends, his name will ever remain a household word, clothed with only bright and happy memories.

In the death of our associate *we* have lost a scholarly, cultivated and generous friend, who has filled with honor and great satisfaction every responsible position at our disposal. His brilliant intellect, varied attainments, earnest, honest, and modest bearing, made him not less dear to our scientific friends abroad than to us. In his visit to Europe within the past year, the profession at home, with which he was so closely identified, was honored in being represented in the International Medical Congress by a man possessing such rare accomplishments.

In closing the honored grave of Dr. Dean, the dental profession has lost a member of whom it has justly been proud, and the community in which he labored a thoroughly attached citizen, earnest in his devotion to its interests, keenly alive to every improvement, and active in every movement calculated to increase its prosperity.

Resolved, That a copy of this expression of our appreciation of Dr. Dean, with the assurance of our sympathy, be sent by our Secretary to his relatives, and also be recorded upon a memorial page in our Transactions.

D. C. HAWXHURST.

WHEREAS, It has pleased our Heavenly Father, in his goodness and wisdom, to remove from among us in a foreign land and among strangers, and to call to his eternal home, our friend and brother, Dr. D. C. Hawxhurst; and

WHEREAS, In the severing of these earthly bonds, our heads are bowed in sorrow; therefore

Resolved, That we deem it proper at this time to give to the world an expression of our feelings over the sad loss that we have all sustained.

Resolved, That in Dr. Hawxhurst we recognized capabilities, and a promise of a greater sphere of usefulness than fell to the lot of many of his years; modest and unassuming as he always was, still the glory of a brilliant career, the result of indomitable energy, perseverance, and deep research, seemed ever breaking forth from his soul, giving promise of a rich and useful life in the future.

Resolved, That while we bow our heads and hearts in submission to the rod that smites, still in all sincerity we say "Thy will, not ours, be done."

Resolved, That these resolutions be spread upon the records of this Association, and also that our Secretary be instructed to forward a copy of the same to the stricken wife, to whom we extend our most heartfelt sympathy in this, her hour of bereavement and sorrow.

Dr. REHWINKEL: I think Dr. Dean was a man who deserves more than the ordinary notice of condolement. Those only who knew Dr. Dean well could fully appreciate him. He was a man whom you liked better and better the more you knew of him. A man, perhaps through his extraordinary modesty and retiring disposition not so easily approached as those more forward, but who, once known and his confidence gained, would inspire a fully reciprocal confidence. I have in my life met but few men to whom I would rather have gone on an occasion when I had altogether lost faith in my own judgment, and on whose judgment I would more trustingly have relied. When I received notice through the daily papers of his death I was so unmanned for awhile that I had not the strength to hold the paper in my hands.

There was another man who has joined the grand army above, during the last year, a man not so well known as Dr. Dean, but one who seemed destined to be a bright light in the future—a young man who gave promise of a very useful and profitable life. I allude to Dr. Hawxhurst, of Michigan. I think this Association honors itself by paying proper tribute to both of these departed brethren.

Dr. THOMAS: When men pass from among us who give promise of such eminence as did our friend, Dr. Hawxhurst, it is well to spend a little time in commemoration of their good qualities.

Dr. Hawxhurst was a dear friend of mine, and I love to dwell on his memory. The death of Dr. Dean was followed so soon by tidings of that of Dr. Hawxhurst that we are forcibly reminded that "one woe doth tread upon another's heels, so fast they follow."

As has been said of our friend, Dr. Dean, Dr. Hawxhurst was a man not easily approached with familiarity, but when once his confidence was gained you felt that you had won a prize which you would not relinquish. The more he was known the more highly was he esteemed, and I venture to say there is not a man in this room who ever heard a fellow-practitioner say aught against him in life or death.

The first time I ever met him was in Michigan, in 1869, I being one of the Board of Censors to examine candidates for admission into our State society. Upon his presenting himself for admission, I was at once impressed with his thoughtful manner and his modesty, and at the same time his evident ability. He approached almost an extreme of caution in treatment of difficult cases, as an incident will show. I had under treatment at that time a case of diseased antrum that was causing me no little trouble and annoyance, and feeling the need of some good advice on the subject, I gave him a diagnosis of the case, and asked what he would do under such circumstances. After waiting a moment, he said: "I never had a case like that. I have heard about them, and have seen them in other men's hands, but I have never had one myself." "Well," I said, "if you *had* such a case as that, what would be your first step?" He said, "I should think about it over-night before I did anything." I asked him what he would do next day. "Well, if I was not perfectly sure what to do, I should think about it another day and night before I proceeded to treat the case." But, I said, suppose your patient is suffering and needs immediate treatment, and the suffering is increased by delay? He replied, "I should much prefer that my patient should suffer from that cause than to increase the trouble by treating it improperly."

A very warm friendship sprang up between us at that time, and in the years that have passed since has steadily increased. His "leaf has perished in the green," but surely his desire for higher knowledge, and his constant labor to attain it; his unassuming modesty and lack of all professional jealousy, may be an example to us that we should not be slow to follow. Long live the memory of Dr. D. C. Hawxhurst.

Dr. HARROUN: At a meeting of the Michigan State Dental Society held at Adrian several years since, Dr. Hawxhurst reported a case in practice, giving his mode of treatment, and asked the question why he had failed. It occurred to me that he had not properly understood the nature of the case and I asked him what was the condi-

tion before treatment commenced. The little shot was well aimed and did good work; he saw the point and frankly admitted he had not given that most important part any thought whatever, but from this time on it should have his first consideration. Several articles on diagnosis were written and read by Dr. Hawxhurst in due time, which showed he was in earnest ever afterwards. In the few years which followed the above circumstances in Dr. Hawxhurst's life, we who knew him saw he meant to have a place second to none in the profession he had chosen.

Dr. CROUSE: Probably there are few, if any, who knew Dr. Dean more intimately than it was my privilege to know him. The older members of this Association knew, respected, and loved him, and will cherish his memory. By the members as a whole, he was not perhaps as well known, because of his natural reserve, and because many of the members are comparatively new to the Association. One could not know Dr. Dean intimately without becoming strongly attached to him.

The purity and honesty of his nature shone forth in all the acts of his life. He was a man of warm sympathies, very practical in all his ideas, and hated show and sham more than any other person I have ever met. He was also a man of keen perception and one of the best judges of human nature I have ever known. His unfavorable criticisms of men and acts were always coupled with the broadest charity. He possessed as kind and generous a heart as ever beat in human breast. He was to me the truest friend and wisest counsellor I have ever had. While his loss is irreparable, I am grateful for the years we have spent together.

ADDRESS OF WELCOME.

BY A. BERRY, OF CINCINNATI.

MR. PRESIDENT AND MEMBERS OF THE AMERICAN DENTAL ASSOCIATION:

THE partiality of my brethren has imposed on me the pleasing duty of welcoming you to the Queen City. It were better had this been assigned to some one who could give a more fitting expression of our feelings, but I yield to no one in the heartfelt pleasure your presence gives us. Indeed, this large and imposing convention must be gratifying to you all.

From the position of our city, the center of the population of our country, it is convenient for conventions to meet here. Several have done so this year, and our city is fast acquiring the name of the "city of conventions." In character and importance none of those which have gone before us surpasses this.

Ours is the youngest of the professions. As compared with the others it is in its infancy, but it is our just glory that in the last forty years it has made greater progress than any of the others. Much of this is due to American dentistry, whose pre-eminence is acknowledged the world over.

Other professions may have more high-sounding pretensions, but our mission is the relief of human suffering, often the most poignant, and the preservation or substitution of organs vastly important for health, comfort, and beauty. It is not to be forgotten that the greatest discovery of modern times in surgery—anæsthesia—is a discovery of our profession.

But let us not rest on our past laurels; let us press forward; let us demand that no one be admitted to our brotherhood unless he has the education to fit him for its duties; let our standards be raised higher and higher.

During the sixteen years which have elapsed since you held your annual convocation here, the dental societies, dental colleges, and dental periodicals of our country have more than doubled in num-

ber. There has in this time been a steady progress of our profession in which your Association had a leading part. While in these years all other departments of science have made important advances, the dental profession has, perhaps, outstripped them all. This was formally acknowledged last year by those best able to decide. The American Medical Association and the International Medical Congress recognized dentists as belonging to the fraternity engaged in the practice of the healing art.

You have before you evidence of the great development of the resources of this region in its material and educational interests, since you last held your convention here.

The Southern railroad, three hundred and thirty-six miles in length, representing $20,000,000 of Cincinnati finances, with its extensive Southern connections, facilitating commercial and social relations, promotes fraternal feeling between the people of distant sections of our Union.

You look down on three substantial structures spanning the stream which the æsthetic French call the "Beautiful River;" on one of the largest and best Music Halls; on McMicken University, where thorough instruction is given to pupils of this city of either sex, without money and without price; on our large Public Library building with its stores of learning; and on the most beautiful fountain ever erected. You will find visits to our Astronomical Observatory, and our Zoological Garden pleasing and instructive.

You are surprised when you recollect that here, less than one hundred years ago, was the home of the red man, undisturbed in his rights by the pale face. In its eleemosynary institutions our city is abreast of the advanced civilization of the age. The large and commodious Cincinnati Hospital, controlled and supported by the city, the extensive Betts Street Hospital, with several others sustained by that church whose charity is bestowed on all suffering applicants, without regard to race or creed, our Orphan Asylums, Children's and Old People's Homes, and other charities, minister abundantly to the wants of the needy poor and suffering among us.

In munificent bequests for educational and art purposes, Hughes and Woodward with their High Schools, McMicken with his University, Springer with his Music Hall, Davidson with his Fountain, and West with his large donations for the construction of a grand edifice to contain the treasures of our Art Museum, and a perpetual endowment fund, have set an example worthy of imitation by millionaires of other cities.

You see the spot where was founded the second dental college in the world, and where was organized the Mississippi Valley Dental Association, which for more than a score of years has been the oldest dental society in existence.

Gentlemen, the Mississippi Valley Dental Association, the Ohio State Dental Society, and the dental profession of this vicinity, extend to you a hearty welcome to Cincinnati. May you have a pleasant and profitable reunion.

ANNUAL ADDRESS.

BY H. A. SMITH, PRESIDENT.

GENTLEMEN OF THE AMERICAN DENTAL ASSOCIATION:

On the occasion of our anniversary, our first glance is usually retrospective, in memory of those once among our numbers, but who now survive only in their works. During the past year we have to record the death of one of our most valued associates, M. S. Dean.

It was my privilege to attend the last sad rites at the late home of the deceased, and the signal manifestation of affectionate regard for the man which followed the announcement of his death on the part of the members of this Association, where so many of us have felt for years the fascination that comes from contact with a superior intellect and a noble character, such as distinguished our late confrère, was heightened on that occasion by the almost sacred sorrow that overspread not only the group of immediate friends, but also the large number of professional associates who were in attendance.

The death of Dr. Dean may not, perhaps, be regarded as an irreparable loss, yet when we remember his genial, plain, and generous nature, his cheerful and animated conversation, the variety of his attainments, the extent and accuracy of his professional knowledge, coupled as they were with the modest self-estimate and humility of mind so characteristic of him; when we refer to the valuable contributions from him which grace the pages of our Transactions and add to the bulk of our real knowledge, recalling the great love which he bore for this Association, as manifested in the ever-watchful guardianship of its interests, whether as an humble worker in this body or as its honored President; surely the place in our Association made vacant by the death of Dr. Dean will be a difficult one to fill.

Gone is he! but he has left behind him "footprints on the sands of time."

The present annual meeting marks the completion of the twenty-first year of the existence of the American Dental Association, and as we are passing on in the full strength of our majority it may not be unprofitable if we refer briefly to the methods of work which

have been adopted from the beginning for the purpose of carrying out the objects of the Association. For a period of eighteen years, prior to 1878, the work of the Association was done through committees appointed annually. While we may not overestimate the extent and value of the labor accomplished during this period, we can justly refer with pride to a good number of the papers and reports presented to the Association as having led to direct results in the development and advancement of dentistry. Especially is this true in the departments of physiology, pathology, and histology, and in applied dentistry. From and since 1878, instead of reports by the annual committees, and essays from individual members, followed by discussions, we have submitted the annual reports of the permanent Sections and such volunteer papers as have been approved by the appropriate committee, to whom they are first referred. Only three annual meetings have occurred since the plan of permanent Sections was inaugurated, and yet we think the Transactions give evidence that there has been a gradual improvement in the character and worth of the matter brought before the Association for consideration during this period. Time in all affairs is an important element, and before we can hope to reap the full benefits contemplated by the change, the general membership of the Sections must be brought to fully understand the duties and responsibilities that attach to such a relationship in a body like ours. This is a labor that will largely fall on the principal officer of the Section during the first years. The position of chairman of a Section is of necessity one of great labor and responsibility, since it is implied in his duties that he shall supervise and conduct the work of this Section, and thus indicate to the members what questions most need immediate investigation, what problems need to be solved. In this way he will have assigned to every class of mind a definite task, and have suggested to them, "There is a shore of which the soundings should be more accurately taken, and there a line of coast along which a voyage of discovery should be made."

Having come of age, and entering as we are upon a period which in man indicates great bodily vigor, a rapidly developing mind, and a maturing judgment, with so much already achieved, and with such materials for future achievements, we may well indulge in fond anticipations of the possibilities for good of which this Association is capable, if the great objects for which it was founded are kept steadily in view.

In his address last year the President called attention to the fact

that etiology, the science of the causes of dental caries, had been almost wholly neglected by essayists who had contributed to the proceedings of the Association, and suggested to the Section embracing etiology, that a committee be appointed with the object of making a careful, systematic study of the causes which contribute to the existence of dental caries. Without definite knowledge as to what action this Section may have taken in reference to the very excellent suggestion of Prof. Peirce, I can only offer as an apology for bringing this matter before you so soon again, my firm conviction that there is no subject in the whole domain of the science of dentistry that could more profitably engage the earnest attention of this body; for when we consider that much the larger proportion of our time spent in actual practice is occupied in the treatment of lesions caused by the almost universally prevalent disease which we denominate dental caries, and that notwithstanding the subject has been extensively studied, the fact confronts us, that the efficient cause of dental caries is still a matter for speculation. It is noteworthy, as well as encouraging, that the subject received so large a share of attention before the section devoted to the consideration of diseases of the teeth at the International Medical Congress held in London last year. The papers read before the dental section relating to the underlying and specific causes of this morbid condition, enriched as they were by details of actual experiment and original investigation, were among the ablest and most valuable contributions to that scientific body. And in our own country the study of the minute structure of the several tissues of the teeth, and the investigations made in the direction of the pathology of dental caries by that group of earnest workers connected with the New York Odontological Society, under the lead of Carl Heitzmann, are indications that the dental profession are becoming more and more convinced that all methods of treatment based on any other than definite knowledge, in health and disease, of the tissues on which we work, are at best largely empirical. True dental science may include much more, but certainly it means no less than that when the specific disease which we denominate dental caries is recognized, the efficient causes producing the symptoms shall be known and demonstrable. Less than this is but half-knowledge, and indicates that the status of dentistry has not risen much above the level of an art.

With the view of stimulating investigation in this direction, I would respectfully suggest that this Association offer a prize to members of not less than $250, for the best paper, based upon

strictly original investigation, relating to the etiology of dental caries; the award to be made and announced at the annual meeting in 1884.

A reference to our printed Transactions will discover the fact, that the subject of dental education has received its full share of the time and attention of the Association. Our dental colleges, as Prof. McQuillen was pleased, on occasion, to remark, have been subject to an annual criticism. These strictures have usually been made in a friendly spirit, and no doubt have in a degree been potent in advancing the standard of dental educational institutions. Occasionally a spirit of impatience has been shown on the part of the "self-assured critic," that the defects which he thought he clearly saw, "did not flee at his bidding." It is to be feared that it was somewhat in this spirit that the resolution regarding dental colleges was adopted at the annual meeting in 1880. As might reasonably have been anticipated, the adoption of this resolution has called forth a protest on the part of some persons who are especially interested in the management of our professional schools, and in its essence the resolution is regarded by them, as well as by others of the profession, as having an "air of dictation not authorized by the power of this Association." This and similar strictures are made by men whose opinions we may not regard lightly, for they are among those who have labored long and efficiently in the cause of dental education in this country. The adoption, therefore, of a line of policy in reference to educational matters, methods of practice, or indeed in any direction that partakes in any degree of a dictatorial spirit, it must be evident, is unwise, and cannot but have a reactionary effect. The history of the attempt on the part of the American Society of Dental Surgeons to exercise the unwarrantable authority of dictating to members the modes of practice they should pursue, which had the effect to dissolve that organization, is fresh in the minds of most of us. Prescription in this instance meant proscription, and as a result death ensued. We may profit also by the experience of the American Medical Association in their numerous attempts during a period of thirty years or more to improve the system of medical education and elevate the standard of requirements for the medical degree, and all without any apparent good.

Dr. T. G. Richardson, in his admirable annual address before that representative body of American physicians in 1878, in reference to this very subject said: "The measures proposed from time to time were sufficiently incisive, and to all appearances admirably adapted

to the ends in view, but unfortunately there was no power in the association to carry them out, and they remain on the record as mere mementoes of the praiseworthy zeal of their authors. We have just now found out," he continues, "that the plan of making war directly upon the medical colleges, endeavoring to compel them to conform their practices to our theories, or else surrender the prerogatives to which they had been so long accustomed, was altogether a mistake, and probably deserved the partial defeat which it encountered. Indeed, I am not quite sure that the many blows which these institutions received at our hands served rather to compact them together, and thus to increase their power of resistance." These are certainly suggestive words, and in them we have an instance of history teaching by example.

Gradually there has been an improvement in the system of medical education. Step by step progress has been made in obedience to the inevitable laws which prevail alike in the world of matter and the world of man. "All things have a slant forward, but a gradual and a slight one," and the history of reform in medical education in this country is no exception to this law, as will be seen when I state that the first medical colleges were established before the war of the Revolution, and that now, after the lapse of more than a century, not more than half a dozen of the one hundred and upwards of medical schools have adopted the advanced or graded system of instruction and a three years' course of study as a requirement for the degree.

The whole system of dental education of to-day in the United States, as represented by the sixteen colleges or departments, situated in ten different States, with their eighty professors, aiding in the instruction of over eight hundred students, has been developed within a period of forty years. In this comparatively short time it is hardly to be expected that a uniform scheme of tuition or of time requirement should have been adopted in all the dental schools, especially when we recall the fact that not more than one-half of those who enter upon the practice of dentistry each year receive any other training than a limited pupilage with a private preceptor in a dental office. We are naturally impatient of results; are too apt to want the end without the means. And if, in our estimate of the status of dental education in this country, the facts I have mentioned, together with the other significant fact that a majority of those who are now in the practice of dentistry in the United States have no degree either in dentistry or medicine, are duly considered; then

we have every reason to congratulate ourselves that dental education occupies the advanced position which it does.

In bringing about these encouraging results, our social society organizations, local, state, and national, have been largely influential, and since our dental schools receive their material and moral support from the profession, it is of the highest importance that the power which this and similar organizations have in creating and directing professional sentiment, and indirectly in enlightening the people in regard to the necessity of thorough special training on the part of those who hold themselves out as competent to treat dental ailments, should be judiciously exercised.

The merits of the several systems of dental education now in vogue in this country are, very properly, subjects for discussion. But whether the education of dentists can best be accomplished in schools especially established for this object, or whether this special mode of making a living shall in future be taught in our universities in connection with other special modes of making a living; or, indeed, as has been proposed by the few in the profession, whether our special degree shall be abolished altogether, and the training essential to successfully practice dentistry shall be supplemental to the acquisition of the degree of M.D., which it is claimed is sufficient and should cover all departments of the healing art,—these are questions that may safely be left to time, the great arbiter of all things.

SECTION IV.

OPERATIVE DENTISTRY.

Some Thoughts on Regulating Teeth.

BY WM. N. MORRISON, OF THE SECTION.

I HAVE been very forcibly reminded, lately, of the numerous errors continually committed by old and otherwise respected practitioners, and earnestly defended and imitated by their pupils or students, in the extraction of the sixth-year molars for so-called regulating purposes, it being claimed by them that complete success crowns their efforts in every instance. I very much lament that so much stupidity exists in the profession to-day, that the mistakes cannot be seen by looking at the articulation of any set of teeth, and the facial expression, where such extraction has been performed. It is a rare treat, at this day, to see a perfect arch with a correct articulation. These matters have become so much of a study with me, that when I see persons in the street I can nearly always tell when they have met with the irreparable loss referred to before looking into their mouths.

It is with joy that I welcome all helps to the correction of irregularity. In our text-books and journals there are complicated and labored diagrams and descriptions of appliances, but it is very obvious that "the gigantic intellect does not come to the rescue" in them.

It is the same with fillings. Many operators will put in a simple filling in the crown of a molar and grind down the cusps, and even the enamel ridges, to show off the filling to the best advantage; showing the work in a mirror to the simple-minded patient, who does not realize, until after years, the very serious damage he has sustained.

The idea that continual extraction has no hereditary influence is absurd and ridiculous, though some dentists, in order to convince and console patients for the loss of their teeth, or those of their

children, bring up the old story of the cutting-off of sheep's tails having had no influence upon the length of the lambs' tails at the present day. My experience is that hereditarily contracted jaws are the most difficult to correct of any we have to treat.

During the whole course of my professional life I have only made one mistake in regulating teeth. In that case the patient never developed to normal size; small in stature, diminutive in physique, with large, good teeth in a small mouth, I am free to admit that she would look a little better with that part of her anatomy less prominent.

But look at the thousands of cases at the other extreme. The public are clamorous for deformed mouths! The first demand is to have all the natural teeth extracted and full sets of artificial, little, narrow, white teeth inserted; second choice, about the half of their teeth extracted to improve the appearance of the rest and keep them from decaying; and, thirdly, to have the crowns of the remaining teeth horribly mutilated by filing and grinding. It is a disgrace to the profession that there are so many claiming to be progressive dentists, who accede to such demands and practice to the requirements.

A few months ago the public and a few silly snobs, through the press, went into ecstacies over a great singer's small mouth and beautiful teeth. In reality her mouth was a deformity; teeth irregular, one canine so much out of the arch that when she cast a bewitching smile her lip sometimes caught upon it, and it was with some difficulty she could get it down. Her profile had that sorrowful, dinged-in appearance so common at this day.

Several years ago the papers gave an account of the selection of a characteristic American female head, by the designer of our new silver dollar, that should accurately represent the correct type of American beauty. I do not know the lady, nor her dentist, nor have I had any information with regard to the condition of her teeth or articulation; but, seeing her face upon the few dollars which have passed through my hands, I will venture the assertion that her mouth does not contain thirty-two normally-formed teeth.

In the treatment of cases the great difficulty is to control the patients and parents. In many instances the parents give up long before the child, and say they will have no more to do with it; they would rather see crooked teeth than see their children undergo so much suffering,—nearly all of which suffering was occasioned by changing the application of the apparatus when the teeth were at

their most painful state, for the purpose of cleansing plates or changing direction of force.

Teeth are very easily moved if the force be applied in the right direction, but they as easily return to their old places if the force be too early removed. That is my objection to all of these complicated apparatuses, and is entirely obviated by my system of regulating with screws and levers and rubber ligatures, which are secured to the teeth by thin, annular bands or ligatures of platinum cemented to the teeth with oxyphosphate of zinc, where they remain until the operation is entirely completed. Platinum can be carried between teeth in the most crooked condition, with no more force than would be required to carry a strand of floss silk.

There are no better forces than the old-fashioned screw, lever, and wedge. What we want is the secure application of them, and with this any case can be speedily corrected. In the application of the jack-screw I solder the socket end to an annular band; having selected a tooth in the required position from which to exert force in a right line upon the tooth, I use a similar band, soldering to it a little boss to receive the free end of the jack-screw, which prevents all cutting or other injury to the natural tooth, so that when the appliances are removed the teeth are smooth and uninjured. When I wish to rotate a tooth upon its own axis I use an arm about one-half inch long, with a hook upon the end, soldered to the band projecting from the palatal surface. After the cement is sufficiently hardened, I apply a rubber ligature to any tooth which will exert the force in the right direction. All my fixtures increase the size of the tooth but a mere trifle, and they are tolerated by the tongue with but little inconvenience. I frequently use as many as four jack-screws and several levers in one mouth at the same time. In nearly all cases, if the arches are sufficiently expanded, the teeth will assume their own positions and regulate themselves. Regulation should nearly always be done by expanding the arch, and seldom by contracting.

When a case is completed, I construct a retaining apparatus in a similar manner; securing a bar upon the labial or lingual surface, as the case may require, soldered to platinum ligatures, or bands, which are cemented to the teeth and worn for weeks, months, or years,—if a case should require it,—permitting a perfect cleansing of a tooth upon all surfaces except those parts under the cement, which could not be subject to decay.

DISCUSSIONS ON OPERATIVE DENTISTRY.

Dr. ATKINSON: The aphorisms that have been pronounced in the paper just read are, I think, according to nature and truth. There are two or three points with which I do not agree. That the screw should ever be used to move a tooth I do not acknowledge, but that force must be exerted in a direct line is aphoristically true; and a very little force continuously kept up, is sufficient to perform the work. That it should ever require a year to regulate the most refractory set of teeth I hold to be of the past. I have specimens of plates that have been used in which from thirteen days to ten weeks and two days was all the time necessary to accomplish the regulation of teeth in patients over thirty years of age. I feel that there is a dearth of knowledge of the foundation principles upon which the regulation of teeth depends; and the thought of touching a tooth when it is in a condition of tenderness referred to in the paper is so unpleasant to me, that I wish to speak somewhat upon that subject. If you have such an apparatus as will bring the teeth that are not to be moved to bear upon a portion of the apparatus by the antagonizing teeth, you need never have tenderness in those that require to be moved. Constantly irritating a tooth that is in motion is the sole reason of its being tender. The next heresy is this, that we should move a tooth a certain distance by the turning of a screw. One gentleman has said that you can safely move a tooth within twenty-four hours just exactly the two-hundredth part of an inch, and that after that you may turn the screw up again. That is like taking a candle and tapping your shin successively, by which means you will get it sore, but if you hit it with all the combined force of a hundred small taps of the candle you would not bruise it at all. We are now able to accomplish in weeks what used to require months, and in months what used to require years, in regulating the teeth, and when once they are brought into line, all that is necessary to do is to hold them there, and in a majority of cases not even a silk ligature is needed for that purpose.

[The speaker here exhibited plates which had been used to straighten teeth, and explained their use, stating the time required in each case to perform the work.]

Dr. PEIRCE: With all due deference to Dr. Atkinson's views, I would like to say that while the plates and methods he has described are admirable for the correction of some irregularities, there are many to which they would be wholly inappropriate. So varied are

the cases of irregularity, and the dispositions and peculiarities of patients, that we must adapt our appliances and modes of pressure to the individual case, and not expect to treat all with similar appliances or to obtain uniform results. The application of the screw with its positive pressure in some cases produces admirable results, while in others elastic bands and springing plates, with their gradual and constant tension, serve equally well.

Dr. SHEPARD: I understood Dr. Atkinson to say that one of those plates remained in the mouth from the 30th of May until two weeks ago.

Dr. ATKINSON: About six weeks.

Dr. SHEPARD: How many times was the plate removed for cleansing the teeth?

Dr. ATKINSON: Not at all.

Dr. SHEPARD: Were the same elastics kept on all the time?

Dr. ATKINSON: The same elastics, except two that broke.

Dr. SHEPARD: In my opinion, as a general rule, an appliance for regulating the teeth which cannot be readily removed by the patient for the purpose of cleanliness, is not a skillful appliance. It seems to me that cleanliness in this matter of regulating the teeth is one of the most important things which we should keep in view. Plates can be made which will accomplish the same that is claimed for those described by Dr. Atkinson, which can be removed after each meal and cleansed and put back by the patient. The principal criticism which I have to make of Kingsley's "Oral Deformities" is that in two hundred pages relating to the regulating of teeth, about three lines are all that there are devoted to the idea that cleanliness in that process is an essential thing. The keeping in of an appliance for two months without cleaning, seems to me to be a very dangerous thing for the teeth and for the health of the soft tissues as well.

Dr. ATKINSON: All that I have to say in regard to that is this, that I pity the perception of cleanliness that needs to remove the plate. The individual who knows what cleanliness is—in the sense of wholesomeness or freeness from foreign bodies—and who understands disinfectants and washes that can be used, need not go any further, and I will pit my patients against any man's for cleanliness of the mouth with the apparatus which I have presented. Those who object to this appliance on this ground do so under a misapprehension.

Dr. MCKELLOPS: This is a subject in which I take very great interest. I was one of the fortunate ones who went across the water

last year, and this method which I saw there is alone worth to me, and I think to the profession, thousands upon thousands of dollars. In my opinion in this small box is contained the apparatus for regulating the teeth, the best adapted in the majority of cases, and for cleanliness and ease to the patient superior to all others. A child can remove it himself. To give an illustration: my little boy, twelve years old, had a plate in his mouth which was made in the city of London by Dr. Coffin. On ship-board, whenever he would get sick and go to vomit, he would take the plate out and put it in his pocket, and afterwards put it in again, and by the time we reached this side of the water—in nine days—the tooth was regulated. I had nothing to do with the apparatus after it was put in the mouth of the child. He did it all himself. I have with me Dr. Coffin's split plate. I saw the models of twenty-five hundred cases. During the time I was having a plate made for my son at Dr. Coffin's, I saw nine cases under treatment. This method is very simple. The whole thing rests upon a little piece of steel piano-wire. The impression of the mouth is taken very accurately, and that is done with gutta-percha. The cup is adapted to the patient's mouth, the gutta-percha taken out of the hot water, placed into the cup and generally dipped into cold water on account of its carrying so much heat, just to chill the surface so that it will not injure the membrane of the mouth. He then puts that into the mouth and lets the child or person bite upon the plate until it comes up thoroughly. The impression is then removed and immediately immersed in a cup of cold water, which causes the gutta-percha to contract to its normal condition as it was in the mouth; thus he gets a very accurate impression of every tooth. The great secret lies in getting a perfect fit of the plate. A plaster model is then made, the wax put upon it, and then

this piece of steel wire is bent into the shape of two S'S and coated with tin; it is then bound together with binding-wire so as to keep

it on the model, and the ends are imbedded in the wax, when it is ready for packing for vulcanizing. After the plate is fitted to the mouth it is sawed in two through the center. The edges are dressed and filed off nicely, and then it is put into the mouth. You will be astonished at the rapidity with which the teeth can be moved by this appliance, and at the slight inconvenience it causes the patient. It is no wonder that the parent gets angry when he sees the child suffering the tortures which many of the plates and jack-screws so much used often occasion. In that case the first thing the child will do is to throw the plate away if he can get at it. In using Dr. Coffin's plate any child can take it out or put it in, just as he pleases. All that is required is skill in making the plate, and although it looks very simple it requires an artist to make one. I understand from my friend, Dr. Shepard, that this appliance has been used in Boston for fifteen years. If they have used it there they have kept it under a bushel. I have been in Boston very often and have never seen anything of it. The first that I saw of it was in London, and to Dr. Coffin all the credit is due. He invented it and has published it to the world, and I tell you it is worthy of the American dentist. He is an American dentist; I have known him for twenty years, and he is yet the same generous, high-toned American he always was.

I wish to relate a case illustrative of the injudicious use of jack-screws. A young lady called upon me for advice, having one of her teeth crowded entirely out of the arch, and turned transversely. I decided that it would be better to take the tooth out, and so stated to her mother, because its loss would not have disfigured her mouth to any extent; but her parents would not consent to that, and so they put the child in the hands of another dentist to regulate the case. He, after trying for some time to regulate the case without taking out any teeth, extracted the bicuspids, when the application of the jack-screw and other appliances was continued, and it was but a short time thereafter until the two front teeth and one lateral were gone, and just before I left home I discovered that from pressure upon the first bicuspid on the left side it had died, and now, from the plate she wears, I think she stands a good chance to have no teeth at all.

[The speaker here illustrated by plates and diagrams the method of Dr. Patrick, of Belleville, Illinois. His remarks in connection with the subject, without the diagram, would be unintelligible to the reader.]

Dr. NOEL: I have had a great deal of trouble in locked cases. Two or three years ago Dr. C. R. Taft, of this city, gave me a suggestion that has been of great advantage to me. His method was to make a vulcanized rubber plate that would cover the crowns of the molar and bicuspid teeth, so that the shutting of the lower jaw upon the appliance would drive the plate up into position. With that appliance, by cutting little slots in the plate behind the tooth he wanted to move, and putting in blocks of wood, the swelling of the wood carries the tooth forward rapidly. Such an appliance can be removed at meal time. A few days ago I had a case in which the bicuspid teeth were just erupted, and the molar teeth were so short that I could make no plate that could be held in position firmly enough to get any action on the teeth. There was a central incisor crowded out of the arch. I had used little blocks of wood against the central on the right side, which was in position and against the lateral, crowding it out until I could use no more blocks of wood. It occurred to me to use a block of stationer's rubber a little larger than the block of wood I had wedged in. I passed a silk ligature through the rubber, tying it to the central which was crowded forward, allowing the ends of rubber to act upon the two teeth which I wished to move, and they were carried out in twenty-four hours.

Dr. SHEPARD: I rise merely to give my indorsement to the Coffin method. Ten years ago Dr. D. M. Clapp, now of Boston, was in the employ of Dr. Coffin, of London, and he brought back to Boston these plates, and during the last ten years they have been used in Boston. Two years ago last May, at the meeting of the Odontological Society, at the house of Dr. N. W. Kingsley, of New York, I exhibited in connection with other things the Coffin plate, and the members of that society to the number of about fifty were present. I have used it extensively during all these years, but never did I appreciate thoroughly its value nor the great variety of cases in which it could be employed, so as almost entirely to supersede all other methods, until in London last summer we had the opportunity of seeing hundreds of plates that had been worn, and the models of mouths that had been treated at the office of Dr. Coffin.

The article of Dr. Walter Coffin has been published extensively in the magazines of Great Britain and in this country, and if any man is a reader of the journals he ought to have read that article, and I trust those who have not will look up the magazines and find the article and read it carefully. Then with the study of the plates, as Dr. McKellops has suggested, he would be able to understand the

matter thoroughly. The credit belongs to Dr. Coffin. A split plate of Dr. J. D. White's is illustrated in Kingsley's "Oral Deformities," but it was an affair of so different construction and upon such different principles, that it does not deserve to be mentioned in connection with the Coffin plate.

I would like to add one or two practical points to what Dr. McKellops has suggested, which might be of advantage. I think he did not mention that before dipping the end of the wire into the melted tin, it was necessary to do as the jeweler who soft-solders always does, dip it into the muriate of zinc preparation, and then the tin adheres perfectly. I have been in the habit of using three sizes of wire instead of one, which enables me to get different strength of spring. I have also been in the habit of dipping my whole spring in tin, so as to get rid of the oxidation of the steel, and it will remain tinned a very long time. There are some mouths in which oxidation is somewhat rapid, but the steel wire generally becomes blackened on the surface, and the oxidation is not of the rough nature that is seen in rough iron and steel. Another important thing in connection with the making of the springs, is to scar or wound the wire as little as possible, making every bend a graceful curve, without any sharp angles, and that requires a good deal of dexterity, and very nicely curved pliers. The practical points involved, I think can hardly be obtained without a demonstration, and I hope that Dr. McKellops will demonstrate the bending of the spring to any member who may feel interested. My main object in rising was to urge upon members to investigate this method and try it, being sure they will be convinced of its great simplicity, efficiency, and value.

Dr. FIELD: I think I have been fully repaid for my trip across the ocean by the benefit I have derived from this one thing. I have been taught from my childhood up that the sun rises in Boston, but I think the glory of its rising must have been very much darkened by the clouds of ignorance between there and here. It is strange that they have never let us have a little of this light that they have had for the last ten years. I had heard of Coffin plates before, but I had not seen one till I went to Europe, although I have been to two meetings of the American Dental Association in Boston within a few years past. I hope our Boston friends when they again get anything that is as good as this will not allow it to be quietly hid away in their laboratories and offices for another ten years before telling the profession of it.

Dr. DARBY: There is one very important point in connection with

this subject that has been omitted. Dr. McKellops did not state, when speaking of capping the molars, the importance of capping all of them. If the first molar be capped and the second not, the latter will elongate, and in a short time thereafter it will be found to have changed its position, thus producing a mal-occlusion of the jaws.

The readiness with which teeth elongate in the mouths of young subjects when from any cause the opposing force is removed, was well illustrated in the mouth of one of my little patients a year or two ago. A girl of fourteen years of age applied for treatment. The incisors of the lower jaw were nearly a half inch behind those of the upper jaw when the mouth was closed, and the molars so short that the lower incisors struck the gum, in which they had made indentations from one-sixteenth to one-eighth of an inch in the mucous membrane. My desire was to elongate the molars, and to accomplish that end, I put into the roof of the mouth a rubber plate, and allowed the lower incisors to strike it, thus leaving a space between the bicuspids and molars. At the expiration of six months I found, much to my satisfaction, that the molars had elongated and were touching again. A thicker plate was substituted, and after being worn another six months, I found the molars had elongated to such an extent that I had more than one-eighth of an inch space between the lower centrals and the gum when the mouth was closed. My next effort was to draw the upper centrals backward, which I did nearly a quarter of an inch. When the teeth were in the desired position, I inserted a rubber crib plate, which capped the molars, and then run as a narrow band around the incisors, touching them high up on the labial surfaces. This plate will be worn at least a year, or until the teeth are firmly fixed in their new positions. It is of the utmost importance that the teeth be held firmly in position until nature has performed her part of the operation.

I heartily indorse all that Dr. McKellops has said in favor of Dr. Coffin's method of using the split plates and piano-forte wire. I was present when Dr. Coffin read his paper and when he showed a half-bushel of plates and models. He certainly gave unmistakable evidence of the success which had attended his efforts in that direction.

Dr. EAMES: I want to add a few words in reference to the process of Dr. Patrick. The liability of the displacement of the molar teeth, as in the cases alluded to by the gentleman preceding me, is obviated in this appliance, because we have no cap over any of the

teeth; hence, the articulation of these teeth is not interfered with. The apparatus can be used for different cases by a very ingenious arrangement of thumb-screws; the rings being fitted nicely to the teeth the wire band is slipped through them, and by a thumb-screw on the side the band is shortened or lengthened as desired.

[The doctor continued his remarks, illustrating by the chart the method of adapting the appliance to suit different cases, and concluded as follows:] I will state that I have been using this very successfully for some time. A patient can wear it without any inconvenience. There is no trouble about cleansing the teeth. It can be worn while eating, and with a little instruction much of the adjusting can be done by the patient. I have in many cases used this apparatus very successfully for patients out of the city who could come to me but once a week.

Dr. BUTLER: Dr. McKellops has described very nicely the method of using the Coffin plate, but I regret that he was unable to state that he has made a sufficiently practical test of this method to be able to give the result in his hands. This subject has been written about and illustrated in the journals by Dr. Farrar, and it is all very nice on paper, but practically it is good only in a limited sense. One set of appliances will not cover all cases. Dr. Atkinson has given some forms of plates that will apply very nicely in some instances, but there are cases in which they will not answer the purpose. This process of Dr. Coffin's I concede to cover more ground than any other mode that has yet been presented to the profession,—I will not except the process of Dr. Patrick—and it is not expensive. With skill displayed in its construction and application, a large variety of cases may be reached. It has another advantage, the fixture can be removed for cleansing in most cases and readjusted by the patient. It is not so difficult to move teeth into proper position as it sometimes is to hold them there until they become fixed; so that the putting on of a retaining splint as described by Dr. Darby, or some equally effective procedure, is quite essential in the majority of cases.

Dr. EAMES: I think that of the two appliances that of Dr. Patrick is the simpler, for the reason that you have no plate to make—only the band with its attachments, which may be very simple; an impression is not necessary in many cases. It may be constructed as follows: Select the teeth to which to attach the apparatus, and to them fit closed rings of thin platinum; a piece of clasp-material one-eighth of an inch in width, flat on one side and convex on the other, and long enough to pass around the arch in front of the teeth from

one ring to the one on the opposite side, constitutes the band; solder the ends of the band to the rings; opposite the teeth to be moved, on the outside of the band, solder a small shot of gold, or a short platinum pin with a head, for the attachment of rubber bands or ligatures. This completes the apparatus—all that is needed in many cases, and it can be made and adjusted in one hour's time by any one of ordinary ability.

I understand that Dr. Patrick has made arrangements with The S. S. White Dental Manufacturing Co. for putting this apparatus on the market. When this is done we can keep in our operating-cases an appliance which will aid us greatly in these most trying and perplexing cases of irregularity.

Dr. DORRANCE: I doubt not that those present hitherto unfamiliar with this method will attempt its use when opportunity hereafter occurs; therefore I wish to emphasize an important point as yet only hinted at. Those who try the Coffin regulating plate must be cautioned against using too large wire, for they will doubtless be tempted so to do. A very small wire (say, $\frac{25}{1000}$ to $\frac{30}{1000}$ of an inch, or about number 20 to 21 of Brown & Sharpe's plate-gauge in diameter) will accomplish a great deal, with very satisfactory results and little liability to injury, whereas a heavy wire will act so rapidly that severe pain and serious injury are sure to result. Great care should also be observed in opening the spring to increase the pressure, as the expansion will be rapid though a small wire and an apparently slight pressure is used.

I also wish to emphasize the importance of investing all the teeth back of the cuspids with the plate. With the Coffin method, after the arch is spread, any tooth may be moved in or out, or twisted in its socket by means of a simple spring (of the same small piano-wire) imbedded at one end in the plate, and having a direct pulling or pushing bearing, or being attached by hooking into the loop of a ligature well tied to the swell of the tooth.

As the plate may almost invariably be so adjusted as to be readily removed and replaced by the patient with little danger of its proper action being interfered with, this method of regulation has the advantage over every other method in point of cleanliness.

Dr. KEELY: In my quiet way, I have done considerable in the line of correcting irregularities of the teeth, during the past quarter of a century; but at no time have I ever imagined that because my apparatus accomplished the work nicely, there was no better way. Over twenty years ago a little miss, aged eight years, came to me

with the superior incisors erupted and locked inside the inferior teeth. For the first time I made a vulcanite plate, covering the permanent and temporary molars and taking a bite. When the plate was finished and adjusted—there was a masticating surface and the teeth raised apart to allow the refractory ones to swing clear in their passage to their normal position—a bar was carried in front of the teeth on which were two little buttons opposite the misplaced teeth; rubber ligatures were placed over the teeth and held by the buttons. This plate was adjusted at 4 o'clock in the evening, and when my little patient called the next morning at 8 o'clock, the teeth were in their normal position. She made no complaint of soreness. The plate was put in again, and the teeth tied to the buttons with No. 40 cotton thread, and the mother shown how to do it. My patient was sent home, and the mother instructed to remove the plate next morning, and put it on every night for a week. It has been said that "teeth once in place, they will remain there." Had I not taken these precautions, as stated, these teeth would have fallen back the first night, for the reason that, as a rule, a child sleeps with the mouth slightly open, and when teeth are moved so rapidly, they must be held in position for a time. In a case like this, I would now make the same kind of a plate, dispensing with the bar in front of the teeth, and making the plate thick on the palatal surface of the misplaced teeth, then cut slots in which I would place sea-tangle tent, which expands gently and will soon force the teeth into place. I would then take No. 40 cotton thread, tie it around the deciduous canine on one side, carry it back of the incisors, and tie to the other canine and leave it there for a week, when the work would be accomplished.

Dr. Morrison condemns the extraction of first molars. I wish to say just here that I do not allow any one to appreciate the value of first molars more than I do. They have a very important part to perform, and do very much in keeping in shape the contour of the face; and under *no circumstances* would I remove one, unless I felt *perfectly satisfied* I was doing the *best possible* thing for my patient. We find many of our little patients, 8 and 9 years of age, with the first molars wholly demoralized, and with our best efforts we can hope to save them only a short time. If the anterior teeth are crowded, I would rarely hesitate to remove the molars; and it should be done prior to the eruption of the second molars, so that they will come forward and take up part of the space made vacant by the first, and, as a rule, they will come squarely up to the second

bicuspid, and look as well as the first molars, and the crowded anterior teeth will fall into line. I only wish I had two or three diagrams here to illustrate this matter from cases in my own practice. A lady, who is now twenty-five years of age, came to me prior to the age of twelve. I found the first inferior molars had been extracted, and the second pretty well erupted. In the superior arch, the anterior teeth were crowded—piled one upon the other. The first molars were decayed, but could have been saved. I did not hesitate to extract them, for it was clearly indicated in this case. I did not see her again for several years, when she came to have some teeth filled. I have a model of this case, taken when she was twenty-five. The superior misplaced teeth fell back, and the second molars came forward bodily, and are squarely up to the second bicuspids in both arches, looking as perfect as any first molars I ever saw. The third molars having ample room are well developed and stand squarely up to the second.

Five years ago a miss of twelve years came to have her inferior molars extracted; the teeth were very much broken down, the pulp dead in one and badly exposed and inflamed in the other. All the anterior teeth were crowded in both arches, the superior canines two-thirds erupted but wholly outside the arch, the laterals and first bicuspids being in contact. Both arches were well developed, and I can only account for this crowded condition from the fact that her deciduous molars were removed before the eruption of the first molars, and when they came, they took up a part or all the space legitimately belonging to the second bicuspids: hence this crowded condition. The superior molars were decayed, but could have been saved. The second molars below were partly erupted and the superior ones just appearing, none of them antagonizing. I made an application to the troublesome inferior molars, and sent the girl home with a note to her mother, telling her what I could do for her daughter if she would put her under my care, and that no fee would be charged. The expressions of appreciation in the mother's answer, and the little miss' saying to a mutual friend that she was preparing herself for a teacher, and that if successful Dr. Keely should be fully remunerated for his services and kindness, paid me better than any other case of regulating I had done. I extracted the first molars at one sitting, and the courage she displayed won my admiration. For a time I waited to see what Dame Nature would do, but I found the second molars were coming forward so rapidly, and taking up the space left by the first, that I wedged the bicuspids back to give

room for the rest of the teeth to fall into line. The teeth are now in good condition,—the canines are in place. A vulcanite plate was worn a few weeks to expand the superior bicuspids a very little to improve the contour of a beautiful face. The second molars are very nearly in contact with the second bicuspids and have come forward with no indication of tipping. Had it been possible to save the inferior molars permanently, both arches could have been expanded and the teeth brought into line.

Dr. PEIRCE: Where economy in time and simplicity in appliances are desirable, I have found that where lateral incisors—one or both—were encroaching upon the palatal surface and striking within the inferior teeth, a most admirable and prompt method of correcting them was to drill upon the palatal face, just below the cutting edge of the tooth, a small hole, and also upon the first molar of the opposing side a similar hole, just at the margin of the gums; then procure a strip of heavy platinized gold plate, in width about one-fourth inch, and in length sufficient to bend to the outline of the palatine arch and be out of the way of the tongue, and with the end sharpened to a point, to spring with some force into the holes in the opposing teeth. The elasticity of the plate so bent, will be found to be sufficient to press the lateral forward into position, where room has been previously gained. This appliance has the advantage of pressing only upon the teeth, producing no irritation of the gums, and of being of comparatively little inconvenience to the patient; while the plate can be made and adjusted without taking an impression or making a cast. The work and result are promptly accomplished and the small holes in the teeth are readily filled, so that the teeth suffer no disadvantage from them. The same appliance can be used to press forward the central incisors as well as the laterals, and by a little careful adjustment of the plate, the two laterals or the two centrals at the same time.

Dr. KEELY: I spoke of the benefit I had conferred on my little patient by removing the first molars. I wish to refer to another benefit, conferred every time it is necessary to remove first molars before the eruption of the second. The second molar will come forward and give ample room for the eruption of the third. The life of this latter tooth in a majority of cases is crushed out for want of space, and we are all too prone to consider it of little or no account. Give a third molar ample room to develop, and you will find it as good as the second. This you will find is true, nineteen times out of twenty.

When in Chicago, recently, I saw a case of irregularity, which I hope Dr. Crouse will explain.

Dr. CROUSE: I have had one extreme case, the models of which I am sorry I have not here, as they would illustrate what can be done in the mouth of a young man twenty-one years of age. When he came to me the position of the upper teeth was such that by the force of mastication the under back teeth were driven toward the tongue, constantly narrrowing the circle in the lower teeth so that there was not room below for his tongue, and he could not talk in a voice to be understood, the lower front teeth protruding beyond the upper. He had been tinkered at by some inexperienced parties for five or six years. I had first to move the upper teeth; and I do not think I exaggerate when I say the back teeth were moved apart an inch, which just gave room for the teeth to come into proper line in the arch. The patient was a young man of large physique. The work was accomplished entirely with rubber plates and jack-screws, but I had to apply two jack-screws. He would break the screws every few days with the force applied. It was a year before I dismissed the case. I first enlarged the upper arch and held it in place, and then proceeded with the lower. Now the teeth are all in position.

The young man continued to follow his employment and was very little inconvenienced. He did the work himself while I did the advising. I do not see how any thing could have worked better in this case than rubber plates with jack-screws vulcanized in them, and the plate cut in two.

Dr. MARCKLEIN: Judging from the appliances exhibited and the remarks made on the subject, it seems to me that they all are very efficient so far as expansion is concerned. I would like to ask Dr. McKellops if they are as applicable for drawing teeth backwards? It has always been with me a very easy matter to throw teeth forward, but it has been very difficult to throw them backwards. I have used all appliances in regulating teeth, and I don't think any one of them will answer all cases. I have one case of a young lady sixteen years old, whose upper teeth project just one-half inch beyond her lower ones, giving her a very unpleasant expression. Her first upper molars are lost and the second are sound and in their place. I would like to know what appliance would be best to draw those ten upper permanent teeth so as to get them in their proper place.

Dr. MCKELLOPS: Here is a plate for that very purpose. I do not claim that every thing can be done with one plate. There must be a variety of plates, and the skill of the operator comes in play here

to enable him to get his bearings right and to bend the wire so that the pressure is exerted in the right direction.

Dr. MARCKLEIN: The only anchorage that I can see that we can have in a case such as I have mentioned, must be furnished by the two superior second molars. The other teeth must all be thrown or drawn backwards, and I would like to know if the anchorage on those two teeth will be sufficient to make it possible to throw back all the other teeth. My experience has been that the molars come forward a great deal easier than the others come backward. I can readily see the value of this appliance in the case of one or two teeth, or even four, but here we have an extreme case of ten teeth to be moved, with only two upon which to anchor.

Dr. THOMAS: Move one at a time.

Dr. MORRISON: Dr. McKellops, as long ago as 1865, brought the original Coffin plate from Europe. It was a rubber plate with caps for the molars merely. I have used those plates under Dr. McKellops's order and directions, as I was associated with him at that time and was doing that kind of work particularly. They are very good plates for some cases where the molars are large and you can get good anchorage, but where the teeth are small, with short crowns, they are of no account at all. In the latter class of cases the shape of the teeth is such that if you do not tie the plate with ligatures up above the swell of the tooth, it will slip off. If you tie it above the swell you are obliged to cut into the healthy soft tissues an eighth of an inch.

I offered you this morning an entire substitute for all such inconvenience as this. I said at the outset in my article that these old bungling things ought to be things of the past. I offered you something which can be adjusted at the swell of the tooth. There is not a gentleman who has made a remark that bears upon the point last referred to, since the discussion was opened.

SECTION VI.

PATHOLOGY, THERAPEUTICS, AND MATERIA MEDICA.

The Possibilities in the Treatment of Pulpless Teeth.

PAPER BY A. O. RAWLS, OF THE SECTION.

IN pulpless teeth there are two tissues more or less intact and devoid of life, viz., the enamel and the dentine; two tissues still existing,—one with a possibility of but very slight break in its nutritive continuity, viz., the pericementum, the other with the probability of numerous breaks in its channels of life, viz., the cementum. In the case of alveolar abscess the same tissues, as above, are usually involved in the same manner, and to the same degree, but there are exceptional cases in which this does not take place. These latter cases are those wherein the abscess does not cause destructive lesions at the apex, or apices, of roots of teeth; as when it occurs at the point of bifurcation of roots, upon the sides of roots, etc. Aside from the conditions mentioned, alveolar abscess may involve, in addition to the above, more or less loss of the periosteum and process in the vicinity of its attack, thus leaving the process in proximity to the abscess either partially or completely denuded of its proper covering. In all pulpless teeth, whether the condition is complicated with alveolar abscess or not, there is, of necessity, a break in the nutritive continuity at the ends of their roots. In all cases of alveolar abscess there exists a similar condition in which the nutritive supply is cut off, either from the cementum or the process, at the point of attack.

I believe it is the generally-accepted opinion that there is but one periosteal membrane between process and tooth; also that this membrane is attached to both process and cementum by minute shred-like prolongations or ramifications of its connective tissue, together with nutrient vessels passing into and out of its substance. This being true, any inflammatory action may, according to the location of its cause, result in an abscess which will destroy the connection either between the process and the membrane, or the cementum and mem-

brane, and may ultimately involve an entire dissolution of more or less of the membrane at the seat of disease. It is to the latter probabilities that we may ascribe the differences of opinion relative to the question as to whether all conditions of this character are abscesses or ulcers, or some are abscesses and others ulcers.

An alveolar abscess which has for its cause a dead pulp generally presents, at some period of its existence, that condition known as a dentigerous cyst or sac. When occurring upon the sides of a root, or in the bifurcation of roots of teeth, it may have the same cyst-like character, but it oftener partakes of the character of an open or superficial ulcer. If the inflammatory process causes a separation of the pericementum from the cementum, but leaves the membrane more or less perfectly attached to the process, the sac-like condition will most likely for a time prevail. On the other hand, however, should the attachments first be broken between the process and the membrane, a cyst or sac is not likely to be formed, but, as is more or less frequently the case, the membrane will rapidly melt away and the lesion will present all the characteristics of an ulcerated surface. The physical differences therein are as follows: In the one case we have an open ulcer, with no specially-defined limit or line of action, while in the other we have a more or less closed ulcer, with a more definite demarkation between healthy and diseased tissue. So far as these physical aspects are concerned in the breaking-down of tissue, they probably amount to the same, all things else being equal; but their effects toward assisting or retarding the reparative process would seem to be at variance.

Now let us recur to the subject proper. You are aware that success in the estimation of some practitioners is not success in the opinion of others. The principal questions here involved are, by what standard do we measure success? and by what should it be measured? I anticipate the answer of some of my confrères by stating that the standard should be the length of time teeth so treated may be comfortably retained in the mouth. I also anticipate the answer of others by adding to the statement, "and be of service to the patient without detriment to surrounding tissue." My comment on such answers is that they simply imply varying degrees of success in conformity with the toleration of lesions present, by the endurance of the patient or integrity of the part involved. It is of common note that dentists speak of the cure of these cases as though it were absolutely perfect, and similar to the cure of a cut or wound in any external soft tissue. If this is true, *i.e.*, if the lesion is healed in a

physiological manner, after that of healing in other tissues, it must be in one of two ways, viz., 1st, by a complete restoration of lost periosteum or process, or both, to and in their normal condition; or, 2d, by the formation of what may be termed false tissue, which, not being normally nutrified, is much more likely to be broken down.

Let us begin examination by taking for our first case a superior central incisor in which the dead pulp has been separated from the living tissues at the apex of the root by a physiological process. All practitioners will admit the comparative simplicity of such a lesion, and, with myself, acknowledge that if a perfect restoration of at least the periosteum involved can take place about the roots of any teeth so involved it certainly can in a case of the character above mentioned.

Prosecuting an examination into the physical, chemico-physical, and physiological conditions likely to be present in such a case necessarily exacts inquiry in several directions. First of all, the question as to whether the root-membrane in health has any connection with the vessels and tissue passing into the nerve-canal at the apex of the root must be settled. If it has not, then, in case of death of the pulp there is no break in its continuity at this point, save by contact and possible irritation of dead tissue of the pulp or other foreign substances. If a connection does herein exist, then death of the pulp breaks it, and conservative treatment will, in so far as this lesion is concerned, be successful in proportion to the degree of re-establishment of nutrient circulation at the point broken.

For the present, however, let us admit the truth of the former condition, viz., that there is no connection between these two tissues at or near the end of the root. It will be much easier for us to argue complete success from such a stand-point.

So much, then, being admitted, we have, in the case under consideration, a simple disconnection, at the apex of the root, of tissues once passing through to nutrify the dentine and other parts of the tooth. This break has been healed by a separation of the dead from the living tissue in a physiological manner. Now, this would seem to indicate complete success in an endeavor to save the tooth, and no doubt, if such a result be possible, it can be attained in this case, by a careful and thoughtful manipulator. But even here we necessarily contend with the possibility, aye, probability, of inorganic or disorganized organic irritants which may remain in contact with vitalized tissue at the end of the tooth after removal of the pulp. Aside from this, in the operation of filling the root-canal, we are

brought face to face with two difficulties, viz., that of securing a filling-material compatible with the healthy tissue whose border it should barely, yet actually, touch, and that of placing such material in such position that it would not impinge upon or be distant from this tissue. And yet these are not all of the influences operating against complete and lasting success in the conservation of such teeth. On the contrary, we must admit, even though there be (normally) no continuity of nutrition between dentine and cementum, that an animal substance like the dentine cannot, when deprived of vitalizing sustenance, remain continuously in juxtaposition with living tissue without affecting the integrity of such living tissue in a greater or less degree.

This case, of which I have endeavored to present the characteristics somewhat in detail, is, as you may readily see, one of those most favorable for treatment looking to successful results. Indeed, such teeth, presenting the conditions enumerated in the foregoing pages, are so often saved in usefulness to the patient for a number of years, without apparent detriment to or loss of surrounding tissue, that it would seem like making mountains out of molehills to even mention their characteristics. Nevertheless, the same underlying principles herein exist to modify success as are present to bar its probability in similar though more extensive lesions, the difference being only a matter of degree rather than character of conditions present.

Now, let us instance another case wherein exist similar diseased conditions, but presenting more extensive disruption of tissue. You have observed in practice (for I think such conditions common, even in a limited practice) that at times there is a denuding of the root-membrane about the immediate end of the root, consequent, at least, upon continued contact of dead, disintegrating, or suppurating tissue. To exemplify, we will take for example an inferior incisor or cuspid tooth, the shape of the root not exactly common to such teeth as a class, and yet very often met with, viz., one with the root flattened laterally, and thus comparatively thin from side to side; the dead pulp has been removed, the root is denuded of its proper covering for, say, an eighth of an inch from its foramen, and the remaining membrane thickened and irritated to the degree of cell-proliferation for at least an eighth of an inch further toward the crown, and if the membrane is continuous from the point of separation from the root with the process round about the lesion it may be, and probably will be, inflamed to the extent of its separation.

However, we may have in such cases a complete destruction of the membrane beneath the end of the root to a point diagonally downward from its point of contact with the root. This relative position of attachment to root and process is due principally to the operation of physical laws. In either event, *i.e.*, whether the periosteum maintains its attachment to the process beneath the end of the root, or, on the other hand, is melted away, you will certainly bear me out in the statement that to secure a perfectly successful re-establishment of, first, contact of periosteum with the part from which it is broken, it is necessary in one instance that there be a gradual development of the process from beneath the periosteum, or a thickening of the latter until its apposition is normally complete with the surface of the cementum; and in the other case, *i.e.*, where the membrane is entirely destroyed beneath the end of the root, that this development of either periosteum, or process and periosteum, take place from the points of attachment to root and process downward and inward toward the apex of the root involved.

This admitted, allow me to call your attention to the fact that still another difficulty, of much graver aspect, must be overcome before the nutrient current between the cementum on the end of the root and the periosteal source of supply can again be normal to the part. I refer to the difficulty of a formerly organized—though now disorganized—tissue again accepting a physiological union with the newly-developed membrane, and by such union re-establishing organization out of non-affinitative and, indeed, we might say, entirely foreign substances.

Now, if it be true that in these most favorable cases there exists such opposition to the return of the parts to normality, such definite and destructive character of forces to be harmonized ere success can be perfect, I ask you what must be expected in cases of alveolar abscess of long standing, in which we would labor to conserve the organ or organs at whose root or roots the lesion is most extensive? I ask you, Gentlemen of this the representative body of our calling in this country, are we not presuming too much at the hands of the *so-called mysterious vis-vitæ*, and reckoning too little of the chemical, the physical, or chemico-physical possibilities in the treatment of these cases?

SECTION VI.—Continued.

Diatheses and Cachexiæ.

PAPER BY F. M. ODELL, CHAIRMAN OF THE SECTION.

IN the diagnosis and treatment of the various ailments to which we are liable, it has always seemed to me, that however beautifully the practitioner may have been in the habit of lecturing or writing, he not only in his practice often falls far short of carrying out the line of therapeusis that might be expected of him, but absolutely fails to *perceive* anything beyond or preceding the most prominent symptoms and "physical signs." Indeed, one of our well-known writers replied to me, in speaking of diabetes, "No one has a tendency towards diabetes; you have it, or you don't have it, and that's all about it! You cannot have a *tendency* that way."

With all due deference to that gentleman, in consideration of his superior age and greater practical experience, I must hold to my preconceived opinion that not only can one have a tendency that way, but that the time is not far distant when medicine must follow in the footsteps of her younger sister, dentistry, and devote the energies of her ablest sons, not as now, principally to the observation and treatment of symptoms, (thus permitting these sons aforesaid to supinely fold their hands while the fell powers of disintegration and darkness carry us rapidly down to an untimely grave), but to the unraveling of that chain of personal or family history underlying and far anterior to these present and conspicuous manifestations; and by personal or family history I do not wish to be understood as intimating that the practitioner should busy himself with the past history of the patient or his progenitors, as individuals, as to whether they lived here or there, well or ill, married or divorced much or little, or with any matters having within themselves more of the elements of gossip and scandal than of scientific research after truth to aid him in a proper estimation of the case under observation, but simply that he should make a proper use of those God-given faculties, which, incited by his course of preparatory studies, strengthened by his practical or clinical training and experience, and directed

by a painstaking desire to use whatever he may possess of judgment in the interests of his patient, shall enable him to not only note evident symptoms and physical signs, so called, but commencing with them as the initial step, to work his way back in those processes of molecular metamorphosis whereby he can deduce not only the inciting causes of the pathological condition before him, but the remote cause or causes which made this pathological condition a possibility. In other words, that medicine must adopt much more of prophylaxis, based upon scientific inquiry, before her disciples can afford to sneer at our efforts in a more circumscribed sphere of usefulness.

Some few of our medical practitioners loom up above the vast majority, and not only pursue successfully an exacting calling, but find time to reason and write upon the subjects of their daily observation and thought; but the vast majority figuratively exclaim with a fellow-student of mine when, the clinical professor having led us up to a diagnosis, and he (the student) having named the malady brought before us for treatment, "At last I am a physician! Now I can practice!" And having reached this sublime altitude, they immediately consider that having learned the trade, they can now sleep upon the field of battle; in the future it is only necessary to follow the regular formulæ, and success is assured;—and to many, unfortunately, so it is; for if the medical pretender be a person of good address, or belongs to the proper congregation, or has the requisite amount of unblushing effrontery, he can generally find more who are willing to be dosed by him for prominent symptoms than his more diligent but less dashing co-laborer can, of those who are willing to be treated upon rational principles.

And this brings me to the underlying thought of my present inspiration, viz: the subjects of diatheses and cachexiæ. To go into an exhaustive dissertation upon these points would only be to wear out what little patience you have left, and, perhaps, to open an endless and partially profitless discussion; because, among medical writers and speakers, I find the most diverse opinions and assertions in regard to what should be classed as diatheses, and what cachexiæ; but in general terms I would simply designate diathesis as that weakness or tendency towards disease which is entailed by the law of heredity, and cachexia, as that tendency in the same direction, arising by reason of the circumstances of environment, habit, or experience of the individual.

Authorities (?) differ as to the number and nomination of either; and the innumerable instances of diatheses being crossed in the same

individual, render their pronouncement somewhat difficult at times; but the certainty remains, that the practitioner who has so well studied the physiognomy of disease as to clearly perceive the particular diatheses which he has to deal with, has enabled himself to stand upon the same, or even a higher plane of usefulness than does the old family attendant who has been present at the advent of the patient into this world of trials and tribulation, and has had him under supervision ever since.

In order that you may not accuse me of talking medicine, and ignoring dentistry in these remarks, I will refer to a matter which is particularly within our province, and endeavor to show that we cannot practice as simple mechanics any more than can the regular medical practitioner, without at once giving up all our boasted claims to be considered men of scientific attainment.

In a recent case of recession of the gum, with soreness, dropping of the tooth from its socket, occasional slight points of ulceration, rapidly followed by loss of tissue, little evidence of pus, after cleansing perfectly from tartar, and painting at the extreme limit of contact of gum and tooth, with aromatic sulphuric acid, I found the case growing no better very fast; the neck of the tooth at one side becoming exposed much further towards the apex, and the soreness becoming so intense as to seriously threaten the loss of the organ through the impatience of the patient, I took the patient's measure somewhat more carefully, and concluded that local treatment would be more successful if supplemented by iodide of potash, or a little mercury; and I found that such was the fact when I merely used palliative treatment for the gum, and administered co. cath. pill, with cod-liver oil and tonics, varying the latter every third day in order to better conserve an exceedingly capricious appetite. Result:—in a week, great improvement in hopefulness, etc., and much better condition of gum; attachment having taken place again one-third the length of the tooth below the apex of the root; but with greater hopefulness came less docility, and for three weeks I saw nothing of the patient; then he presented himself with the gum all gone again, notwithstanding his having been very careful to keep it cleansed, syringing three or four times daily with a very weak solution of phénol sodique. A return to aromatic sulphuric for local treatment only made matters much worse, and the hot weather being against us also, I suspended further operations in that direction, and commenced again on iron and quinia in pill, and locally simply washing with weak solution of chlorate of potash. And in this connection

I will mention a dressing for ulcers which is easy of application, and very pleasing in its action. It is to simply drop a little mat of cotton upon the surface of glycerin, and then reversing the cotton, dust over the surface of the glycerin which adheres to it a little salicylic acid, or a little salicylate of soda. Both act well, and are very soothing in their effects.

Another case presenting lately, I did not treat locally at all; because, from the evident rapid retrogression in metamorphosis of tissues in that vicinity, the bony socket having entirely subsided from one tooth, pulp dead, and the triumphal arch of little pustules covering one-third of each adjoining tooth, combined with the little, blinking red eyes of the patient, and their tumefied lids, and the evident eagerness of their possessor to pay very liberally for relief, I at once relegated the tooth to the forceps, and the case to the domain of the cachexiæ; believing that the regular family practitioner could best meet the indications.

The first-mentioned case I divided for treatment between a diathesis and a cachexia; the former being responsible for the mercurial, the latter for the tonic.

Of late I have involuntarily become much interested in the study and observation of gout in its various manifestations; and without in the least drawing upon imagination, can see the very close relationship existing between gout, rheumatism, hay-fever, rose-cold, diabetes, Bright's disease, and a host of complications under as many different nominations, which all tend in the same general direction, but which in their effect upon the general system, may be compared to the value of stock in one of our great arteries of commerce, which is profoundly impressed, as a whole, if a fluctuation of any magnitude is felt in one of its branches.

It is all very well, nay, sometimes imperative to adapt the treatment to the mitigation of the prominent symptoms, but in order to a radical cure the diathesis must be determined, and a few blows struck in that direction fall with telling effect upon the sequelæ.

In hay-fever, for example, *i.e.*, in true hay-fever, the inciting cause of the temporary disturbance, we may, for argument's sake, admit to be the titillation upon the end organs of the nerves of smell induced by the pollen of plants; but this particular inciting cause being removed, any new irritation of the same peripheral nerves—from the dust of a room or road to the exhalations from an onion or a piece of cheese—serves to perpetuate the impression for days and weeks, until, in some instances, it becomes a chronic habit or cachexia, and

is no longer dependent upon times and seasons. For the immediate relief of the early symptoms, a little vapor of cubebs or saltpetre, or a weak solution of salicylic acid or borax, may serve the purpose, but for a cure, a treatment of the diathesis best answers. If the diathesis be of gout, I have great faith in salicylate of potash; if of scrofula, some form of mercury would do good, while salicylate would be wasted time and material.

And speaking of salicylate of potash, I have very little faith in its ability to reduce temperature, but the fever accompanying this condition is very readily controlled by a combination of the salicylate with sulph. quin.

And here again we see an evidence of the justice of some of the principles of Homœopathic practice, viz., that a treatment which will certainly subdue a fever arising from one cause, is with modifications good treatment in all other fevers.

In this connection I cannot too highly recommend the use of water internally and externally, varied from ice-water to hot water, according to the indications, for all conditions, whether pathological or physiological.

In hay-fever, one of the most intolerable symptoms is a burning or itching sensation at various points of the body, notably at the inside of the calves of the legs. This is either entirely relieved, or rendered nearly imperceptible in a very few minutes by a hot bath, followed by a solution of borax in water, or water and alcohol; and free perspiration, without being excessive, is maintained by indulging at the same time in plentiful libations of either ice-water or hot tea, as the appetite may crave. The chief difficulty to be provided against afterward, is sudden reduction of surface temperature, and this end is excellently well served by some newly-put-upon-the-market underwear, viz., that made of a large sized net-work, similar to a fish net, which by its large meshes enables a considerable layer of air to officiate between the skin and the clothing, as a gradual medium of exchange of temperature between the body and the external atmosphere. Thus, by a simple mechanical contrivance, we can materially assist in the conservation of body-heat in winter, and the gradual dispersion of the same in summer.

This contrivance, which feels excellent, and makes a splendid appearance, I regard as of great interest to all, for the greater part of our ailments are the result of our carelessness in this regard, either arising from our ignorance or from circumstances beyond our control whereby we fail to regulate somatic heat-production or heat dispersion.

SECTION VI.—Continued.

Hydrogen Dioxide.

PAPER BY A. W. HARLAN, OF THE SECTION.

WHEN the treatment of alveolar abscess was under discussion before the Section on Diseases of the Teeth in the International Medical Congress, last summer, Mr. Walter H. Coffin, of London, spoke of the use of hydrogen dioxide, and of its efficiency in those cases where no fistulous opening was established, mentioning casually that by injecting the sac with this new agent it could be easily evacuated without coagulation of the contents or clogging the canals at the apices. After some ten months' quite constant use of this remedy, I am induced to present a few observations on the preparation of $H_2 O_2$, and the mode of using it.

As it is not always possible to obtain hydrogen dioxide of sufficient strength to be useful, the following is offered to enable those who may so desire to prepare it for themselves: To prepare hydrogen dioxide small portions of purified moist barium dioxide (binoxide of barium) are gradually added to a cold mixture of one part of sulphuric acid and five parts of distilled water, taking care to prevent the temperature from rising beyond 68° F., and suspending the addition when the liquid has only a slightly-acid reaction. The precipitated sulphate of barium is allowed to deposit, and the liquid is filtered off. It is best to retain the slight excess of sulphuric acid, since the compound keeps better when this is done. The solution thus obtained, which scarcely ever contains over five per cent. of hydrogen dioxide, may be concentrated either by exposing it *in vacuo* over sulphuric acid at a temperature of 59° to 68° F., or it may be exposed to cold and frozen, and the frozen portion removed. The residuary liquid by the latter process will be much more concentrated than that by the former, as hydrogen dioxide does not freeze even at —30° F. If the solution is allowed to evaporate over sulphuric acid, it may happen that bubbles of oxygen will begin to be given off. In this case, the addition of a few drops of sulphuric acid will arrest further decomposition.

The aqueous solution, if not too strong, can be preserved for months if it is kept in a cold place, not exposed to light. Hydrogen dioxide is easily soluble in ether. If the aqueous solution is shaken with ether, the latter dissolves out the dioxide. The ethereal solution is much more stable than the aqueous, and may even be distilled without decomposition. An easy test for determining the quantity of hydrogen dioxide present in any aqueous solution may be made by strongly acidulating the liquid with sulphuric acid, and adding from a burette a solution of potassium permanganate of known strength until the purple tint of the latter is no longer destroyed. In this case the following reaction takes place:

$$\underset{\text{Potassium Permang.}}{K_2Mn_2O_8} + \underset{\text{Sulphuric Acid.}}{3H_2SO_4} + \underset{\text{Hyd. Diox.}}{H_2O_2} =$$

$$\underset{\text{Potas. Sulphate.}}{K_2SO_4} + \underset{\text{Mang. Sulphate.}}{2MnSO_4} + \underset{\text{Water.}}{4H_2O} + \underset{\text{Oxygen.}}{3O_2}$$

Each gram of potassium permanganate used corresponds to 0·108 gram of hydrogen dioxide.

During the past year, in general medicine, renewed attention has been drawn to this agent, and the most extraordinary curative effects have been attributed to it, with what propriety the future will show. It is, for instance, stated that "no physician who has only once tried hydrogen dioxide applied in spray to suppurating eyes or suppurating wounds will ever want to be without it." "Passing a few times across a sick chamber while projecting a spray of a two-per-cent. solution renders the air odorless and pure," etc. To show its antiseptic properties, Guttman mixed nine parts of urine with one part of dioxide and allowed it to remain nine months, and it did not putrefy. MM. Béchamp and Paul Bert have, by a series of experiments, discovered that oxidized water arrests fermentation from the presence of living organisms, but is inert in the presence of amorphous ferments, such as diastase, saliva, pancreatic juice, etc. As it is not improbable that the compound will be more frequently experimented with than before these later investigations, some statements contained in a recent circular of H. Trommsdorf, the well-known manufacturer of chemicals at Erfurt, Germany, will be of interest. He says: "It is occasionally stated that distilled water can contain 'ten volumes of hydrogen dioxide;' this is wrong, and is due to an erroneous conception of the words 'ten volumes' which is attached to the quotation of the article in the price-lists. Hydrogen dioxide in its pure state is a *liquid*, and not a gas, and the

'ten volumes' is meant to convey that the product contains ten volumes of available oxygen,—or, in other words, one measure of the commercial liquid can give off ten measures of oxygen. This corresponds to a three-per-cent. solution of hydrogen dioxide. A 'two-volume' solution would be one which gives off twice its volume of oxygen,—or which contains 0·6 per cent. of H_2O_2. Most of the peroxide of hydrogen in the market is little more than a solution of commercial barium dioxide in dilute hydrochloric acid, and possessing but feeble keeping qualities." At present Trommsdorf's product contains three per cent., or varies but a trifle from that figure. It must be kept in a cold, dark place, in glass-stoppered bottles, which should be small if the consumption of the article is insignificant.

I have always used the aqueous solution in the treatment of blind alveolar abscesses and *pyorrhœa alveolaris*, as I have found the rapid evolution of the oxygen to effect a thorough evacuation of the pus. One may see the thin, frothy contents of a non-fistulous abscess—even though the tooth is in the lower maxilla—gradually escape from the sac beneath, if this agent is thoroughly applied. Hydrogen dioxide is such an unstable compound that it immediately decomposes when exposed to the air or is brought into contact with the contents of the sac, liberating oxygen, which unites with the pus and causes it to escape. The unsatisfied molecules of oxygen mechanically distend the sac, thus forcing the pus from it, and thereby causing its complete evacuation. Such an agent must commend itself to any one for the simplicity of its working, as a ready and efficient means of accomplishing so difficult an undertaking as the removal of pus from around the apex of a lower cuspid or bicuspid, without creating any unpleasant after-effect. In practice, after opening the canal, I at first very gently wash out the canal from whence the pus is oozing, and afterward carefully inject the remedy into the sac, which is immediately distended by the evolution of oxygen, and the complete evacuation of its contents follows. I then introduce strands of cotton saturated with volatile eucalyptus, and lightly seal the cavity. The dressing is to be changed in three days, when, if there is no pus or odor, the canal is to be packed tightly with cotton moistened as before, and sealed with gutta-percha. In a week or ten days the root may be filled, leaving the cavity of decay to be filled when convenient. In some cases it may be necessary to use hydrogen dioxide two or three times, at intervals of three or four days, in order to arrest the production of pus. It is always neces-

sary to adjust the rubber dam over the tooth while treating it or changing the dressing. I prefer the volatile eucalyptus as the after-dressing, on account of its not being escharotic or irritating to such a surface as is presented after the use of $H_2 O_2$.

These brief observations are not offered for the purpose of discouraging the so-called "radical" treatment of latent abscesses connected with teeth, but to place in the hands of careful and delicate manipulators a remedy which will prevent much suffering to the patient, if used intelligently. I venture to suggest that $H_2 O_2$ may become useful as a bleaching agent for discolored teeth, as it is now largely used in the arts for bleaching; but, so far, I have not tried it for that purpose. Other uses of this new agent will, doubtless, suggest themselves,—a remedy which, I hope, is to become a valuable addition to our too slender list of efficient therapeutical agents.

DISCUSSIONS.

Prof. MAYR: One of the sentences of Dr. Rawls's paper was, "are we not presuming too much on the *vis vitæ* and recognizing too little the chemical forces in our treatment of such cases." I have heard the expression *vis vitæ* used very frequently, but not a person thus using it has been able to give me an acceptable definition. Before I can say any thing about it I would like to hear Dr. Rawls's definition of it.

Dr. RAWLS: *Vis vitæ* is my idea of what is generally called a force which we know not of, a force which is mysterious and intangible, which is referred to as the force of life separate and apart from physical, chemical, or chemico-physical action.

Prof. MAYR: It is in my opinion nothing but an empty word, and whenever I hear the expression "*vis vitæ*," I like to know the exact component of the *vis vitæ* which is referred to. For instance, it is said that "vital force" unites by first intention the two surfaces of a recent wound. That is an expression in my opinion that ought not to be used in our scientific century. There is something definite which acts to unite them. How are those surfaces united? We find that proliferation takes place, but what produces this? The only scientific answer is, I do not know; for we cannot go further without using an empty word, which does nothing but blur our minds and impede our progress. I now understand the gentleman perfectly well, but I thought perhaps he had a peculiar idea that I would have liked to get the definition of.

A year ago in the meeting of the Connecticut Valley Dental Association, I spoke of hydrogen peroxide and suggested that it might be used for bleaching teeth, but there were so many opinions as to how it should be used that no agreement could be arrived at about the manner of its application. It was thought it might be sealed into the cavity of the dead tooth and then slowly allowed to ooze out, but the objection to that method is that oxygen is disengaged so rapidly that it would finally burst the tooth. Then it was suggested that it might be applied by painting on the outside of the tooth two or three times daily, but the question arose, will the hydrogen peroxide go through the enamel? The enamel, according to the latest investigations, has fine openings. It is a finely-organized structure, and is capable of allowing fluids to percolate by endosmosis and exosmosis, but in all probability this circulation would be so sluggish that it would bleach the teeth too slowly to be of practical value. The cause of the discoloration of the teeth is a disputed point. I have tried in vain to inform myself about it from the journals, etc. The necessity of scientific investigations becomes very apparent when we attempt to discuss this subject.

We cannot intelligently proceed to bleach a tooth before we know what has discolored it. That is something for the investigator in histology to settle. I myself am unable to give an exact opinion. I have only the supposition that the tooth is discolored by a hematin-like substance of the red blood-corpuscles under some form. If we knew in what form the hematin existed in the tooth we could give the exact substance to bleach it. The antiseptic properties of hydrogen peroxide are not due to oxygen, but to ozone. About six years ago a gentleman in Berlin prepared ozonized water by allowing air passing over moist phosphorus to bubble through water. A small quantity of ozone, which is always generated when phosphorus is in contact with moist air, was dissolved in the water in this way. This ozonized water was antiseptic and excellent for the treatment of wounds.

Dr. INGERSOLL: I wish to bring to the attention of the profession an ulcerative process beginning at the apex and reaching to the neck of the tooth, arising from another cause than that of salivary calculus. I assume this to be a fact:—that no pulp dies a spontaneous death without causing disease in the peridental membrane. The forms of disease which may follow are various; it may be chronic inflammation of the peridental membrane; it may be tumefaction of the membrane; it may be a permanent induration of the sur-

rounding parts; it may be alveolar abscess, or it may be alveolar ulceration. We often hear the profession speak of ulcerated teeth —using the term synonymously with abscess. I think that very little distinction has ever been made by the profession between these two terms as applied to the formation of pus about the apical portion of the root. I thought that I had arrived at a very satisfactory treatment of abscess, yet I found cases supposed to be abscess and treated as such, in which my treatment failed; and I did not understand why I failed. But on more careful study of my failures, it dawned upon me that these cases presented a form of disease that is not alveolar abscess, but alveolar ulceration—having none of the characteristics of alveolar abscess, except that of a pus discharge, yet differing from *pyorrhœa alveolaris*. There was no circumscribed pus-cavity; no formation of a tubular canal running out from the pus-cavity to the surface; no thick ichorous pus, but a thin, watery fluid, and no tendency to swell. I therefore said, this is not abscess, but something else. About this time I extracted a tooth, in the treatment of which I had failed, and I found covering one quarter of an inch of the apical end, a hard, firm incrustation, unlike any salivary calculus, of a very dark color, and much harder than any salivary calculus I had ever seen, and in appearance granular. The inquiry that first came into my mind was, how could saliva reach this point to deposit its lime-salts? The gum was firmly adherent to the neck of the tooth, except at a single point where a lip of gum acted like a valve, permitting egress but no ingress of fluids. I judged therefore that the deposit could not be of salivary origin, for saliva could never get there except by injection. Gravity would not take it there, for the extracted tooth had come from the upper jaw. My next pertinent inquiry was, what is its source—what the conditions of its formation, and what is its nature?

Not being accustomed myself to conduct chemical analyses, and not having secured an analysis from any other person, I have not been able to make reliable comparisons of these deposits with salivary calculus as found upon the crowns of teeth. But it is quite certain that we shall not find in it organic matter such as we find in salivary calculus. And we shall not be likely to find any epithelial scales. The chief fact to be observed is that it is *not* found in connection with alveolar abscess, but always when present, is found in connection with *alveolar ulceration*, of which diseased condition it is a *result*, not a *cause*. These facts I have thought sufficient to determine the fact that it comes from the *liquor sanguinis*, the watery por-

tion of the blood. I therefore pronounced it *sanguinary calculus.*

In the *liquor sanguinis* of the blood we have all the elements of bodily nutrition in solution, including the nutrient elements of bone. When in case of ulceration this fluid portion of the blood passes out, by exosmosis, from the blood-vessels, to become the fluid part of pus, it carries with it the lime-salts held in solution and contributes the same to the formation of this calculus. We have also in the blood *hematin*, which yields its coloring matter to the sanguinary deposit. It undoubtedly contains some broken down tissue, and dead blood-corpuscles.

With this rational analysis of the nature and source of the deposit, I concluded that we have on the roots of teeth a distinct formation of calcareous matter, usually called salivary calculus, which is *not* salivary calculus, for the simple reason that it is not and cannot be derived from the saliva. You may designate it *calculus* or *lime-deposit* or *tartar*, if you please; but, deriving its name from the normal fluid which is its evident source, I have called it *sanguinary calculus*, because that is a term seemingly in harmony with the nomenclature of science. The various calculi found in the body are named from the normal fluid from which they are derived. I wish further to state that these two forms of calculus, salivary and sanguinary, are sometimes found in contact with each other just below the margin of the gum, having a distinct line of demarkation between them.

A case was presented at my office in which there was not the slightest amount of salivary calculus, but about the eighth of an inch below the margin of the gum there was a distinct black line of tartar. This indicated sanguinary calculus, which came from ulceration—not the ulceration I have spoken of as originating at the apex of the root, but an ulceration which might have been produced by salivary calculus. But as it had been there for many years the *salivary* calculus had wholly disappeared—possibly by a dental operation, or possibly by solution—leaving only the *sanguinary* calculus, which is known by its color and by its extreme hardness.

Dr. PEIRCE: Do you not always find the alveolar process to a greater or less extent broken down where you find this sanguinary calculus?

Dr. INGERSOLL: It has occurred to some, and did occur also to me, that it is possible that the lime-salts might in part be derived from the broken-down tissues of the alveolar walls; but I think I have seen cases sufficient to warrant me in saying this is not the *chief* source, for it is more in amount than the wasted alveolar margin

could possibly supply. In the case I have stated, while the alveolar margins were thin as note-paper at this point, the incrustation was thicker than ordinary card-board, so the calcareous deposit could not have been derived wholly or in large part from this source.

Dr. PEIRCE: I wish to confirm the statement made by Dr. Ingersoll, that this deposit at the root of the teeth is from the blood and not from the saliva. I have seen it where I am satisfied there had been no possible connection between the deposits at the root and the secretions of the mouth. This being the case, sanguinary calculus would be a very proper term for it. The condition in which the tooth is found may give us some idea of its origin. The tooth in color is abnormally yellow, the tubuli are all consolidated, the pulp-chamber, if not entirely obliterated, is well filled with calcific deposit, and all of the blood which originally went to nourish the dentine is diverted with its lime-salts to the cemental membrane of the root, and there makes an amorphous deposit of lime.

Dr. FRIEDRICHS: I would like to ask Dr. Ingersoll how many cases he has seen under the condition that he has described, where the supposition was that the calculus could not be from the saliva.

Dr. INGERSOLL: I saw a great many cases before I ever understood them, but since I arrived at the conclusion just stated, I have seen not more than twenty cases.

Dr. MORGAN: Have you not found this character of calculus in a large number of cases of the so-called Riggs's disease?

Dr. INGERSOLL: I call this one of the manifestations of Riggs's disease.

Dr. RAWLS: There are two ways by which inflammation may take place within the sockets which are occupied by the teeth: first, from external causes; second, from internal causes. External causes pass from without between the gum and necks of the teeth. The internal cause must be one which cuts off nutrient circulation, and this condition is based upon either a want of integrity of the tissues, as the result of a local force operating thereon, or a systemic condition rendering possible to the parts a local expression.

The gentleman has named the deposit upon roots of teeth in *pyorrhœa alveolaris*, sanguinary calculus, because of its analogy to such deposits in other parts of the body wherein such deposits take place, except upon surfaces by inflammatory action. In the valves of the heart, in the kidneys and in the liver, we do not find such deposits in the internal structure within the parenchema of the part, but upon surfaces which are normal or inflammatory, and I appre-

hend that if the gentleman will inquire into these cases more fully he will find that where he meets with this "sanguinary calculus," so called, there exists an entrance from below or above, as the case may be, for such deposits to be made, and because such deposits happen to be of a different degree of hardness or of different color, is no reason at all why it should be termed sanguinary calculus. For that matter all such deposits might be called sanguinary, since the materials forming them must at one time or other pass through the blood and be a part thereof. In such cases the deposit is simply an impaction of free lime-salts, the result of purely physical action of the tissues and substances involved, and such as you have seen in cases of so-called Riggs's disease, are concomitants, not causes; they follow in the wake of systemic disturbances which have been caused by the action of mercury, salt, or some of these elements or compounds. Tissues under such an influence are readily broken down, pabulum is wept out to build up that which has been broken down because of its want of integrity, and not entirely because of any special local irritant; such tissues are not capable of reorganizing or re-establishing complete nutrient supply between themselves and the tissues to which they were once united. When ulceration (which means separation) takes place, the supply of nutrition will be cut off and never again in these cases be re-established, simply because the source of supply is in contact with a substance which is inorganic, or practically so. It is disorganized organic material.

Before closing my remarks, I wish to call your attention to the fact that we are teaching our patients and students that it is possible to save teeth in these conditions, when there is no possibility of doing so without violating the veriest laws of nature; we are teaching our patients that we can cause healthy tissue to grow and develop over dead substances, without encysting those substances; we are teaching that this tissue will grow over roughened surfaces partly dead, and we expect that living tissue to remain healthy in contact with the dead, when there is no compatibility between the two.

I would like to have this subject thoroughly discussed. I would like some of the older heads, Drs. Watt and Atkinson, Prof. Taft and Morgan, to bring this subject out; I wish to see where they stand; I want to see whether or no they believe there is something in the body which is not material; if they have any cognizance of a force that is called vital, that will influence—will cause cure of these morbid conditions and a return to health when there are no physical signs of any such possibility.

Dr. WATT: I guess I am one of those old fellows that have been called on, but for the life of me I do not know what my young brother has been talking about for the last ten minutes, as I failed to hear. This question of sanguinary calculus is not very mysterious. We have been blundering and stumbling over it until my friend, Dr. Ingersoll, gave it a name, and now it is pretty well known. Calcareous deposits are found in all parts of the system. I think Dr. Taft will remember that the late Dr. Samuel Martin and I removed a sanguinary calculus weighing a fraction over thirteen ounces that was imbedded between two of the muscles of the abdomen. It was about the shape of a hen's egg. It was of a dark reddish color, not so black as the calculus usually found on the roots of teeth under these circumstances. I do not see that there is much mystery about it. If you have a dead surface and once get a particle of deposit on it, it will take something from the blood at every round of the circulation. Each round of the blood will make it a little larger, and so it goes on.. What causes the deposit of sanguinary calculus I am not able to say, but I presume it is the disorganization of the blood so as to cause it to drop the first particle, and this occurs as the result of inflammatory action; in other words, there is death of the blood to the extent that it is not able to hold in solution the whole amount of mineral matter which it is carrying, and hence there is a particle dropped. It is very easy to explain the reason why salivary calculus is deposited on the teeth; whenever the constitution is in such a state of debility and tendency to death as that ammonia is found in the buccal secretions, the last named fluids are not able to hold the normal lime-salts in solution and they are dropped. When the saliva holds in solution free carbonic acid, it is able to dissolve the normal quantity of lime-salts, but when the free carbonic acid is, by combination with ammonia or otherwise, taken away, it is not able to hold these salts in solution and they are dropped. You are familiar with the fact that when you boil ordinary spring or well-water from a lime-stone region, the free carbonic acid is driven off and the carbonate of lime is precipitated on the inside of the vessel used in boiling. It is the same in the mouth. Remove the free carbonic acid and the salivary calculus is deposited. Sometimes you may smell the breath of your patient and find that it is loaded with ammonia. As sure as you find that condition you may look for a deposit of salivary calculus or tartar. It is a very common thing for dentists, young and old, to be surprised. They find after having scraped the teeth thoroughly, having cleaned off every particle of

tartar, and having prescribed an alkaline mouth-wash for the patient to use with a brush, the patient will visit them soon again with the same incrustation on the teeth in spite of the use of the brush and the wash. It is not strange. The wash has taken the free carbonic acid from the saliva and the lime-salts are precipitated. What causes the first precipitation of salivary calculus is plain, but I do not know so well what causes the first precipitation of the sanguinary calculus; but this ought always to be borne in mind, that when the first particle is precipitated, there is nothing mysterious about the continuation of the deposit. The affinity of the deposited particle for what is in the circulating fluid will take a little additional from each round of the circulation. The deposit of this sanguinary calculus will be in proportion to the amount of solid matter in the circulation, or in proportion to the ability of the blood to hold it in solution, and in proportion to the room that there is for the deposit. Upon the apex of the root there is not much room unless pressure should cause absorption of the socket so as to increase the room.

Dr. THOMAS: Please tell us from what source we may usually look for the ammonia?

Dr. WATT: It comes from the general breaking down of the system. Sometimes it is given off from the mucous follicles. I have found it when I have cleaned the mouth off very thoroughly, and kept it open until it would ooze out through the membrane itself; testing this exudation with my litmus papers I have found an alkaline reaction from that fluid; placing these in distilled water I have found ammonia in the solution, from which I infer that sometimes ammonia is given off direct from the membrane. I believe, although I am not so sure, that it is given off as an excretion from the salivary glands. Another source is from the respiration. The breath is often loaded with ammonia, and it being very soluble in water, and as nearly every person will do more or less breathing through the mouth, the saliva will sometimes thus become impregnated with the ammonia from the breath, and I think this is the most common mode of impregnation of the saliva with ammonia.

Dr. INGERSOLL: There seems to me no difficulty with regard to the source of calcareous matter when we consider what I have before said, that all the elements of the growing body, both of the soft tissue and the bone, are in the blood; and furthermore, that calcareous degeneration is a very common form of disease in all the tissues of the body. We find calcification of the veins and arteries, and calcification of the valves of the heart. What is the source of this

calcific matter, if it does not come from the blood? Only that can be salivary calculus which is deposited from the saliva. It should be borne in mind also that the lime-salts found in salivary calculus are in solution in the blood before they are in the saliva, and biliary calculus before it is in the bile. Hence we might call all calcareous deposits *sanguinary* if we chose to do so; for, in fact, the *liquor sanguinis* is the original source whence are derived all forms of calcareous deposit. But for the purpose of designating one form or locality of deposit from another, it has been common to name the deposit from the normal fluid from which it is more immediately deposited.

Dr. BUCKINGHAM: We have all the elements spoken of in the blood, and all these lime-salts are held there in solution. They are deposited in a physiological way in the building up of bony substances. They are carried where they are needed, and by some process that we do not understand they are selected and deposited in molecules taken from the blood itself. Wherever you have a solid dead nucleus imbedded in any tissue you may have lime-salts deposited. That would not be a physiological action, but a chemical action. The first process is governed by what is known as life-force, the latter by what is known as chemical force. We recognize the difference between the live and the dead tissue. We recognize tissue that will build up the structure, and we recognize chemical force that will pull it apart and tear it down. What is the difference? Whenever you bring matter together in a certain condition it develops certain forms and so it goes on building up. They tell us there is no great power beyond this that governs this force, but there is no one yet who has undertaken to say that, who will tell you how thought originates, or who can tell how the motion that comes into the ear is transformed into sound. What is force? What do we know about the force of gravitation? How can we explain it? What do we know of why two matters come together? We are perfectly at sea. There is no explanation of these things. Force is from God. It is the same power that made matter, I don't care whether you say it was a personal God or an agent. Matter came into existence somehow. When matter came into existence, force must have come into existence, and the same power that brought matter into existence must be force. Life must come from living matter; it cannot come from dead matter.

I wish to tell you of a new agent for bleaching teeth. A young gentleman of Philadelphia, Dr. Kirk, has been using and recommends

sulphite of soda and boracic acid ground together, to be inserted into the cavity of the tooth after the cavity has been cleaned out. The pulp-cavity should then be filled so that there will be no passage through the pulp-cavity from the bleaching material. The theory is that the boracic acid decomposes the sulphite of soda and sets sulphurous acid free. Sulphurous acid has a strong affinity for oxygen, and when it takes the oxygen from the coloring-matter it bleaches the tooth thoroughly. I give the formula, without giving it an indorsement, so that any one can try it.

Dr. MORGAN: There was a statement in one of the papers that the alveolar sockets were not lined with a periosteum, but that the root of the tooth merely was covered with a periosteum which was united, if I understood the gentleman, to the socket. I take issue there. I think there are two membranes. I think the same periosteum which lines the socket is reflected over the root of the tooth, and that they are connected together by the ordinary connective tissue.

The gentleman propounded the question as to success in the treatment of devitalized or pulpless teeth. There is no such thing as perfect success in those cases. I saw recently two cases from which I removed the pulps twenty-nine years ago last April, so the lawyer informed me in whose mouth the teeth were, and they are in the mouth yet. They have never given him any trouble, but I do not consider that a perfect success.

In the next paper is an allusion to a pus-secreting surface. I do not understand that there is such a surface in the human body. All the secretory organs in the body have a specific function to perform, and though they may perform vicariously the function of some other organ, they do not secrete pus; they simply take from the blood certain of its constituents, it may be because they are in excess or that the matter has served its purpose and has become effete. There are no pus-secreting organs or surfaces, nor is there ever, so far as I know, any organ or surface converted into a pus-secreting organ, or any secretion of pus whatever.

Dr. ATKINSON: I wish to call attention to the fact that in pathological literature there are two sides to the question. One is that there is such a thing as hereditary tendency to abnormal action in the nutrition of the body, and the other is that there is no such hereditary tendency, but that abnormal action originates from some impact of unkindly force that sets up every diseased molecular movement in the nutrition of the body. I hold that it is necessary for us to take the middle ground, if we expect to get the basis of a diag-

nosis or of a prognosis, or of a decision of what remedy will be useful. This is after the same manner of all our investigations. It involves two territories that are part and parcel of each other, which have been treated as if they were separate. To get at the point more distinctly we must take as a first postulate, that we regard as an element of organization the atom, and then the question arises whether in the atom there is any ability to operate *per se*, without the impact of force from without, by reason of what is called spontaneous action, or whether there is only a sleeping energy in the atom that requires the impact of some sort of outside energy to excite it into a healthy or unhealthy mode of activity. We are in what the paper calls molecular metamorphosis, a subject known by very few, if any. Only a very few men who have been in earnest as naturalists have attempted to get at how the organizations are built up as the machinery of function. We must remember that when we are dealing with remedies they must contain within themselves affinities which have relation to the affinity in the molecular mass upon which they operate, and to get to that in its simplest way we must reach it in the process of feeding; if we take what we commonly call food—that is, everything which is capable of being put into the machinery that we call the digestory apparatus, which finally is put into the mass admixture of homogeneous heterogeneity—we are able then to hold all possibility of power in this pabulum that is the result of complete digestion, and every act of health or disease depends upon this hidden movement that has been so much ignored by all men who have depended entirely upon mass-observation for their diagnosis and prognosis and decisions of what kind of remedy to use.

We are in trouble mainly, here as in other places, with regard to what is meant by the terms physiological and pathological. Pathology really ought to be physiology, and it is modified physiology. It really means obstruction of function, and, if in its first form, it must necessarily be normal, but all the literature of the profession says that physiology is the normal action, and when it becomes abnormal it is ranged under the head of this Section.

Dr. FRIEDRICHS: I understood you to say that when a physician is administering medicine or a remedy, the remedy must have a molecular affinity for the disease he is treating. Did I understand you correctly?

Dr. ATKINSON: Either molecular or atomic.

Dr. FRIEDRICHS: Don't you think that you make a rather broad assertion there?

Dr. ATKINSON: I don't care to be quizzed about the breadth of my assertion, if it is true.

Dr. FRIEDRICHS: I do not think there is a man in the practice of medicine in the world who actually knows the effect that a medicine will have when he administers it. Only from empirical knowledge or from mere observation, can physicians say that if a certain remedy is administered perhaps certain results may be attained, but they do not know how the medicine acts or how these results are obtained.

Dr. ATKINSON: I do not see that that is a question.

Dr. FRIEDRICHS: I think it is a generally conceded opinion by all enlightened physicians, that so far as the influence of medicine is concerned we are considerably in the dark in regard to its action, and I can hardly take for granted that there is a molecular affinity contained in the medicine to cure the disease.

Dr. ATKINSON: I don't think I catch your question. I think I can help you by naming the formula I use to my pupils when I am speaking of the changes of food. I say that the feeder has to be fed upon a substance that has died, has had a life-career, and that that substance must have been passed into the condition that is called died or dead, but that being only died and not entirely effete, anything that is capable of being used as food may, under certain circumstances, become either poison or remedy, by reason of the satisfaction or dissatisfaction of the typal proportion of energy in the tissue that is to be fed or is to be restored; and this depends solely upon that hidden law of affinity that resides in the atoms. We have not been able to get behind atoms, but we find that they are in combination; for instance, take water, H_2O—we used to say HO. What do we mean by putting numbers to the symbols? We mean bonds of energy or measures of affinity. And when they are brought together by an electric or magnetic current from the positive to the negative pole, we have two gases that are combined into a liquid which we call water, and it is by reason of the awakening and engaging of these bonds of affinity that they form water. Everything in medicine does that very thing, and that is what we call molecular action.

Dr. FRIEDRICHS: I do not wish to discuss this matter, because we might talk all day and arrive at no conclusion. The main thing in all scientific discussions and papers ought to be demonstrable facts, and in discussions of this kind where no facts can be brought for-

ward we do not derive any benefit, and that is the point I wished to make when I spoke in regard to the effects of medicine as given to cure disease. The facts have not yet been sufficiently demonstrated to show in what mode they act. They may be either a food or a poison, but, nevertheless, we make use of them, because through observation we have found that certain results are obtained from their administration, and that is all. As to how these results are effected we know nothing.

Dr. BUCKINGHAM: Matter is inert. It is only when combined that it produces its effect. We do not know how medicines act, but we know that if we use a certain kind of medicine it produces a certain effect upon the individual, and if by repeated experiment we find its action uniform, we are led to believe these phenomena establish a law. We cannot tell whether the medicine acts as a whole or whether it acts through decomposition. Some medicine acts by being decomposed, and thus acts chemically. Some medicine acts as a whole. Several of our strongest poisons are composed of the same elements in very nearly the same proportion. Carbon, hydrogen, oxygen, and nitrogen, compose nearly all our strongest poisons, and yet these are substances that we are taking in constantly in the shape of food. When these elements are combined together in certain proportions they produce certain effects. By repeated experiments of these matters we may judge to a certain extent how the substance works.

Dr. WATT: The statement is too general, that we do not know how medicines act, and that we know nothing about them. It seems to assume that medicine is medicine, that medicine is a unitary idea. Now, we do understand how some medicines act, and we do not understand how some others act. Take as an illustration the treatment of malarial disease—our autumnal fevers, especially in their chronic form—by the use of arsenious acid. The manner in which that medicine acts is very simple. The man in working Indian corn acts in such a way as to kill the weeds without interfering with the corn, and we administer arsenic upon the principle of interfering with the germs of organisms which cause the disease. Here is a chronic ague, and the tissue has been built and rebuilt, and taken down and rebuilt anew, and here is a great lot of morbid tissue. It is not as thoroughly alive as the tissue built up in a state of health, therefore it is easier killed. Now we introduce our poison,—for it is a poison and medicine both,—we introduce arsenic in that case to kill these morbid tissues, because they have a lower vitality than the best-made tissue in the body. The

medicine may have such strength as to kill them and not kill the healthy tissue, and then the emunctories carry out the dead matter. So there is one medicine, the action of which we know. Take another instance: An anæmic girl comes to us almost bloodless. Some reason exists why she lacks red corpuscles. There has to be an improvement. It is found that iron is an important constituent of the red corpuscles. It is better to furnish the iron in some assimilable form to aid the system in taking it up, in order to get it into the red corpuscles. We often administer food that contains iron as one of its constituents, or if we take the finely-subdivided iron precipitated by hydrogen, we will get iron in a shape that the system, will appropriate in some way or other—I do not mean to tell you how. Some of you say it cannot be assimilated, but I know very well that I have seen scores of pale girls and boys just take metallic iron sprinkled on their bread and butter, and the red blood was developed in them much faster than in their brothers and sisters who did not take the iron. We know how that acts. Some medicines we do know. I think I have illustrated that we do know something about how some medicines act, and we do know a good deal about how food acts, and I don't think I am ready to subscribe to what my friend from New Orleans says. He nearly always sticks to the point, but I do not think it will do to assume that we know nothing about the effect of medicine only empirically. My opinion is that all medicines act chemically, but I will not press that.

Dr. BUCKINGHAM: The doctor says he knows that arsenic produces such an effect. How does it produce that effect? Does it combine chemically, or does it act by its presence?

Dr. WATT: It combines chemically and kills, just as it combines with the albuminous tissue of the rat and kills it.

Dr. BUCKINGHAM: And arrests the vitality?

Dr. WATT: Yes; produces a state of the machinery that is incompatible with vitality.

Dr. BUCKINGHAM: How do you find this out?

Dr. WATT: By analysis.

Dr. BUCKINGHAM: You find that it arrests vitality by experiment?

Dr. WATT: I find by experiment that it kills the rat, and by analysis I find out how it kills it.

Dr. ATKINSON: That is experiment, too.

Dr. FRIEDRICHS: I believe that it is customary before physicians treat a case for them to know the cause of the disease they are treating. The doctor said he knew how arsenic acted in case of

fever. Now, in order to get the medicine to counteract the cause we should know what the cause is. I would like to ask the doctor what causes chills and fever?

Dr. WATT: Go up to my friend Dr. Saulsbury, of Cleveland, and he will show you the little trees. I am not a microscopist, but I have looked at them through the microscope, and they have been taken away to the tops of the Alleghanies and placed on a sleeping-room window, and the sleeper of that room, all unconscious of what has been done, has contracted autumnal fever.

Dr. FRIEDRICHS: Is this question settled in the medical fraternity—the cause of chills and fever?

Dr. WATT: It is settled, but a great many don't know that it is settled.

Dr. KULP: The doctor spoke of children being improved by taking metallic iron upon their bread and butter. I have always contended that in taking medicine for curing disease, it is necessary to take it in such form that it would assimilate easily, and the point which Dr. Watt made, that he saw this great improvement in these patients by taking metallic iron on their bread and butter suggested to me that that was the very reason they were improving,—because they were taking it on the bread and butter. If they had taken it in some other form, nature would have rejected it.

Dr. ODELL: It strikes me that Dr. Watt has sufficiently made out the case that he does not understand anything about the action of medicine, and that consequently Dr. Friedrichs was correct in his statement. The "action of medicine," so called, to a certain extent, we understand; at least we think we do; but when you come to the question underlying that which Dr. Friedrichs asked of us, or of Dr. Atkinson, that is too much for us. How the medicines act, is always a point to which we cannot go. Certain medicines act by assimilation; that is, they must be assimilated in order to act at all, and when we have gotten that far we think we have answered the question, and we have only begun; we are hardly at the A, B, C. We only know that a medicine being present, the result follows, and that is empirical; and when we come to the *how* (which was Dr. Friedrichs's question) we are quite at our wits' ends, and we have no means yet discovered of arriving at the solution of this question. Other medicines act simply by presence. Take the substance of nitrate of bismuth as an illustration. I don't know that you may really call it a medicine in the ordinary acceptation of the term. But it acts by slathering over the surface of the intestines, in conse-

quence of which protective coating all the benefit arises; but we get no assimilation, consequently there is one case where assimilation is not necessary. In speaking of the action of arsenic, Dr. Watt simply stated to us what has been stated for a hundred years or more, that arsenic cures or removes the difficulty; but he has not the first glimmering of an intimation as to why or how it does act. I think we can come a little nearer than that; for arsenic is a medicine which by proof, by tests which are within our reach, has been shown to act upon the nervous system; so by simply a change of the mode of motion (if you may so call it) of the nervous system, we get a different sort of movement, which enables the system itself to resume its normal train of action. Whether arsenic can kill certain low forms of life within the system in the method that he intimates, is to me quite doubtful. It is possible that it may, and it is possible that it may not, but my judgment would seem to intimate that it rather enables the organization itself to work on in its normal train, and thereby get rid of all that is irritating and all that affects the nerves deleteriously.

Dr. WATT: I don't believe Dr. Odell heard me. We do know that these lower organisms die under the administration of arsenic, and that they and the arsenic come out together. It is extremely improbable that the arsenic has its influence on the nervous system by virtue of its affinity for these objectionable albuminoid substances. It simply gives the nervous system a chance to act by cleaning out the débris. The nervous system is always ready to act, if it is healthy and normal, unless there is foreign matter crowding it, and we know that arsenic meets these substances that I have referred to, and comes out in combination with them—that these effete matters do come out and are expelled in the excretions. We know about as much about the action of some medicines as we know about anything. We do not know how it is that the plow turning a furrow pulverizes the soil. We do not know why the soil does not stick together and lie there just as it was before the plow turned it over—that it is not as solid as it was before it turned it over. We do not know why the horse pulling the plow impels it through the ground. We do not know anything in the sense in which Dr. Odell has criticised me. I will acknowledge that I am the leading know-nothing in the whole assembly, but I object to the statement that, as compared with our knowledge of other things, we really know nothing about the *modus operandi* of medicine. There is a sense in which we know nothing about it, and in which we know

nothing about anything else. There is a sense in which we know something about plowing, something about sowing, something about planting, and something about the action of medicine.

Dr. ODELL: The underlying idea that I had in the first place was that, whereas, we always sneer at the word empiricism, about all we know of medicine is empirical, and what we call science is simply the classification of empirical discoveries. It is the part of science to give a reason for what empiricism always discovers. I want to disclaim the idea of attempting to criticise the remarks of any one. I only wish to criticise the ideas which these remarks seem to contain, as coming from apparently such high authority. The way in which some of these actions go on we have learned to a certain point, and we have learned it because we first discovered that such was the action, and then we experimented and saw the same results follow the same causes, but when you come to try to define the effect that certain medicines have upon certain organs you are at fault; and yet more so, when you attempt to follow out the mode of action as upon masses, molecules, and atoms. In the oxygenation of the blood we think we understand the "how" by a mere transference of oxygen to a molecule which demands it, and which is ready to affiliate with it, but when you come to the action of any other known thing upon the tissues of the body, we can merely make a hypothetical statement as to what takes place. Beyond this we enter into the domain of the breaking down of molecules into atoms, and the recombination of those atoms, of which we as yet know very little.

Dr. WATT: If we have a knowledge of the action of oxygen, we know how one medicine acts, and that carries the point.

Dr. ODELL: That is our type, and that is the reason for trying to find out more, but we have not got that far yet.

Dr. ATKINSON: We talk of tonics and we talk of stimulants. Let us see if we can make a statement that will define the action so as to be comprehensible. We have a functioning body made of molecules. There is no such thing as cell-action alone; it is molecular action in combination, that is, a host of molecules gather together and group in a small body that we call a granule, whereby we get that mass-action that we are able to perceive by the senses. But there is a finer mental sense of reasoning by which we must perceive the change that occurs between the pabulum and the needy body, so that it shall be fed. This impact of energy that operates upon a hungry molecule, that does not combine with it, but simply awakes local energy in it so as to perform the function belonging to

the part, is a *stimulant*. Any impact or substance that is taken into and combined with the molecule, therefore, becoming part and parcel of the molecule, is a *tonic*. Tonic then is a food in every instance. The stimulant is the action by presence, referred to by my friend who last occupied the floor. If we make a few of these simple corrections we will regard with less reverence the massive nonsense that has been presented to us as physiological and pathological activity. One word in relation to matter being dead: Every atom has a living and a dead side—that is, a dynamic and a static side, a side of energy and a side of statism or absolute massism. It is doubtful whether we can conceive that atoms ever originated, but when we trace them we find them endowed, as is said, with power, that is, in their normal condition; in their dead condition, when we examine them as atoms, they are in a sleeping state. What is it that sleeps? It is the dynamism, it is the power, it is the energy that resides in it that is omitted,—I do not want to say cause, but I have to say it, —that is motion,—for we really know nothing of causes, we simply know their incidents and consequences. If you have the point, it is this, that we must be more careful in discriminating about these things, whether they be foods, whether medicines, or whether they be poisons. Anything that can act upon a molecule can be denominated either food, poison, or medicine.

Professor MAYR: Dr. Watt said that arsenic killed certain lower organisms, and that they were eliminated. This is what I plainly and squarely deny. As example I give the fact, that in my laboratory there were two bottles in which the mould was thick. One contained a solution of arsenious acid, and the other contained arsenite of soda. These were at that time the only two bottles in my laboratory thus affected. I had a frog that died. I put it in the most concentrated solution—the arsenious acid. After a fortnight the mould was as thick as possible. The power of arsenic in killing the lower organisms is exceedingly weak. The effect of arsenic was, in my opinion, rightly described by Dr. Odell when he said that it acts upon the nerves. It is what might be called a stimulant, or rather tonic, by Dr. Atkinson, and in this way, by stimulating the nerves to greater activity, it exerts its influence.

Dr. WATT: Were the bottles uncorked?

Professor MAYR: Both were uncorked.

Dr. DARBY: We sometimes imagine we know the action of medicine, and yet we are all at sea about the action of arsenic when applied to the dental pulp. Some are of the opinion that it is absorbed,

while others are as strongly of the opinion that it acts by catalysis (by its presence). Dr. Flagg is on record as having said the following: "Then came the action of arsenic on the pulp. I placed a small portion of arsenious acid—one twenty-fifth of a grain—on a piece of cotton, mixed it with acetate of morphia, the whole being in turn mixed with creasote, placed it in a pulp-cavity, and devitalized that pulp. I made *that same* application to a number of teeth, and I left the cotton in each for two weeks, and in some, I think, for three weeks. Each one of those pulps I extracted from those teeth painlessly. It was a perfect devitalization of the pulp. They were taken out and held up before my patients, and they were told 'that is the pulp of your tooth,' and when I held this up and told them, every one of the ten said, 'is it possible that you have taken that from my tooth without my knowledge?' If they did not know it, it could not have hurt them much. These pulps were then placed on paper, the terminal ends where the arsenic came in contact with them were cut off, and the remainder of the ten pulps analyzed in a bunch. They were treated by Reinsch's test for arsenic, which detects a two-hundred-and-fifty-thousandth of a grain. In the whole ten there could not have been the two-hundred-and-fifty-thousandth of a grain, because there was not the ghost of a shadow of a show of arsenic. Now, if there was not the ghost of the shadow of a show in ten pulps, how much was there in one?" If I mistake not, that same piece of cotton with the twenty-fifth of a grain of arsenious acid was afterwards applied to the web of a frog's foot and it killed him as dead as a door-nail. I would not be understood as vouching for the correctness of this statement. It would be difficult to imagine so small a quantity of arsenic producing such wonderful results if it acted by absorption.

Dr. ATKINSON: Was the twenty-fifth of a grain not diminished in quantity? Did he weigh it afterwards?

Dr. DARBY: I don't know.

Dr. ATKINSON: That is the point.

Dr. BUCKINGHAM: I think I know something about that frog. I helped Dr. Flagg analyze it, or rather I analyzed it while Dr. Flagg looked on. Our tests were not very carefully made, but we found what we supposed to be arsenic in all parts of the frog. I did not see the other twenty-five cases in which arsenic had been applied to the mouth, but there was arsenic certainly absorbed and deposited through the whole system of the frog. I refused to indorse his paper, and the consequence was he went home and said he had re-

peated his experiment, and published a paper over his own signature. I would not have anything to do with it. We do know that a very small quantity of arsenic will produce an effect, and although the twenty-fifth of a grain of arsenic will kill a dozen teeth, it does not follow that there is no arsenic absorbed, and we can explain this very easily, because when the pulp was killed the arsenic would be absorbed very little, there would be a cushion through which the arsenic would have to pass before it got into the other parts of the tissue. Arsenic may kill, and yet there may be an almost infinitesimal portion absorbed, but certainly arsenic must act some way rather than by its presence. I agree with Dr. Watt that there may be a chemical combination between the arsenic and the substance itself. Arsenic will act upon that which is weak, and it destroys the vitality in some way, but I don't know how it does it. When the quack doctors undertake to remove tumors with arsenic they apply it to the tissue that is weak or abnormal, and it will devitalize that tissue before it attacks the others. If it is applied to a healthy tissue it will be absorbed clear through, but if applied to diseased tissue it will probably destroy a portion of it, and that tissue becomes a cushion which prevents the absorption of the arsenic, and probably there will be a sloughing off. As to the minute action of the arsenic we have not a very clear idea, and we only know any of these things from experiment.

Dr. ALLPORT: The action of medicines is a very difficult thing to explain; from observation and experience we have learned to expect certain results from their administration; we know they act, but why they act we do not know. We know that we live, and we know that grass grows; we know that foods produce the growth of tissues: but why we live, or why and how these growths are produced we do not know. Life and growth are the results of vital action in obedience to laws of the Infinite which are beyond man's comprehension. Observation and experience have taught us that by mixing an alkali and an acid, we get what chemists call a neutral, but just why we get this result, or why it was ordered that we do not get some other result is known only to Him who created the law. With reference to the action of arsenic in destroying the vitality of the tooth-pulp, and in regard to Dr. Flagg's experiments, I wish to say a word. I do this, not that I wish to fully indorse his conclusions, but because it seems to me that his ideas are not clearly understood here. I read what Dr. Flagg said on this subject many years ago, with a great deal of interest, and I will state what I remember

to be the substance of his experiments as well as the conclusions which he drew from them. He destroyed the vitality of a great many pulps by the use of arsenic, and at different times he collected numbers of them and applied the most delicate chemical and other tests to ascertain whether arsenic had been absorbed or not, and if absorbed, to what extent, and in what part of the tissue it existed. In these tests he found that the least possible amount had been taken up, and its presence was only detected at the point of contact of the drug with the tissue. From this he came to the conclusion that the death of the pulp was not so much from the absorption of the arsenic as from irritation by its presence. His conclusions were that irritation caused an increased flow of blood to the parts (which is always the case with irritation), and that the arteries became so much enlarged that they prevented a return of blood through the veins, and that death was caused by strangulation at the apex of the tooth. In my own practice I have found that much less arsenic is required to destroy an unwounded pulp than one where the pulp has been wounded. I have also found that in some cases by applying arsenic a portion of the pulp would slough off and the balance of the pulp would take on a healthy action and live for years. I doubt not that Dr. Atkinson and others who have paid particular attention to preserving the vitality of exposed pulps have met with the same results.

Dr. BUCKINGHAM: How does he explain how the arsenic got through the whole system of the frog?

Dr. ALLPORT: That he did not explain.

SECTION VII.

PHYSIOLOGY AND ETIOLOGY.

The Origin and Physiology of Nervous Force.

PAPER BY W. C. BARRETT, CHAIRMAN OF THE SECTION.

THERE are two things of which I wish to speak, and these two things make up the sum of the whole universe, so far as man can know. They are matter and force. I say the study of these must form the whole, the entirety of human research, so far as any positive knowledge, or the hope of definite information is concerned. We may speculate and theorize and dogmatize upon things spiritual and metaphysical as much as we like, but concerning them we can by no possibility arrive at any definite conclusion, nor can we *prove* any assertion, it matters little how wild it may be, as either absolutely true or false. When we come into the domain of physics we are studying the actual, the real, the tangible.

I desire, then, for a few moments to consider in a general way matter and force: the one real, positive, palpable, inert; the other immaterial, ethereal, incorporeal, yet dominative over the tactile mass—a law which is ever active in bringing about definitive changes in the passive matter; a ghostly, pervading something, which changes a dead, a lifeless, an inanimate mass of chaos, into this world of life and joy and beauty and animation.

What is this mysterious influence that we call force? Let us examine it. But in what I have to say I desire it ever to be borne in mind that I am speaking solely of physics, and that it has no kind of metaphysical or speculative application whatever. The relations of mind to matter it is no part of my present plan to endeavor to trace out.

Force can be studied only through its chief resulting phenomenon—motion. We find that matter and force are infinitely opposed. Matter seeks eternal rest; force perpetual motion. They mutually react upon each other, matter being by force constantly changed in its characteristics; force by matter continually varied in

mode of manifestation. They are thus mutually interdependent, co-existent, eternal parts of one stupendous whole: interdependent, because one cannot form a portion of this universe without the other; co-existent, because each pervades the other, and eternal, because both can die only together. It has long been an axiom in physics that matter is imperishable. The same train of reasoning which proves this, establishes also the fact that force is indestructible. If an atom can change its condition only through the exertion of force, if its form only can be altered, the bonds which unite it to certain other atoms only be liberated to enable it to form new unions with yet other atoms, and yet if not one of those particles can be lost or annihilated, then can force, only by the reaction of matter, be induced to change its mode of manifestation or its direction. If not an atom has ever been destroyed since matter existed, then it necessarily follows that not an influence, not a wave of force has ever been extinguished since, simultaneously with matter, it first exerted sway. We may, through the action of force, alter the condition of matter; we may, through the reaction of matter, change the character of force; but both are alike indestructible and eternal. Matter is all one, under whatsoever form it may exist. Force is a unit, however it may manifest itself. These are predicates, truisms, self-evident, self-proved, fixed laws of physical science. This doctrine is not new, for as long ago as 1845 Faraday declared that he held the opinion that the various forms under which the forces of matter are made manifest have one common origin, and are so mutually interdependent that they are convertible one into another, and possess equivalents of power in their action. To my apprehension, matter and force are as intimately connected as are what Faraday calls the different manifestations of force with each other. We cannot conceive of matter except as it be subject to force. We cannot imagine power as distinct from the matter upon which it acts. They are essentially co-existent, coeval, synchronous.

Force may act upon matter in different ways, and the result may be motion of a mass, or of atoms. The changes consequent upon this action may be those of external form—morphological, or of internal structure—molecular. According to the peculiar manifestation of it we have been accustomed to call it heat, light, electricity, or chemical affinity; but in whatever mode it becomes sensible to our perceptions, there is one definition which will always describe it, one expression which always characterizes it: it is essentially matter in motion. Heat was formerly regarded as a subtle

substance, with unknown, tangible qualities, and its specific name was *caloric*. It was, with light and electricity, classed as an imponderable fluid, because it was conceived that no other hypothesis would account for the phenomena which they exhibited. Light, it was supposed, consisted of minute characteristic particles, which proceeded from the sun, or from any luminous body. Electricity, also, was regarded as an invisible entity of some kind, possessed of peculiar qualities. It was known rather by its physical manifestations than from any knowledge of its character, but the general opinion held it to be an extremely tenuous matter, which, while pervading most substances, could yet be bottled up, confined, or dissipated at will. It was usually spoken of as the electric *fluid*, and in my early school days I was taught that there were two kinds of electricity—a positive and a negative—which were always seeking to neutralize each other. Further study and investigation made manifest the absurdities of those crude theories, and a new hypothesis was invented—that all these supposed entities, these actual, positive existences of some kind of matter called light, heat, etc., really acted through a specific medium, a fluid which pervaded all matter and all space, an invisible, intangible ether, which, once put in motion by the action of light, heat or electricity, had sufficient power to produce all the violent phenomena which were supposed to be the effects of these agents, and this hypothesis is held by many people to-day. Count Rumford disposed of the material theory by immersing two iron or steel bodies in cold water, and then by the friction or attrition of the one upon the other gradually raising the water to the boiling point. This was the initial attempt at removing the consideration of the study of force from the domain of metaphysics to that of physics.

Prof. Grove first publicly announced the modern theory, that the so-called imponderables, light, heat, electricity, etc., are peculiar states of ordinary matter; that they are resolvable into motion, that they are in fact all very closely connected, and the new doctrine was denominated the Correlation of Physical Forces. The doctrine was taken up by others, the real nature of the so-called forces was studied, and the further proposition was enunciated that they are all mutually convertible into one another. It was necessary in the consideration of these forces to study them in their manifestations, to compare them with other physical phenomena, and to note their resemblances or their discrepancies. It has been determined that most, if not all, the forces progress by means

of an undulatory or wave-like motion, not unlike the advance of the concentric waves made by casting a stone into a smooth body of water. This hypothesis is firmly established as regards sound, not only by actual measurement of the vibrations of resonant bodies, but by the very structure of our own auditory apparatus.

The vibrations produced by light have not only been demonstrated, but accurately measured. And not only this, but it is very clearly shown that the different colors of the solar spectrum are produced by a definite number of vibrations upon the retina of the eye. Further, the very number of these wave-like beatings has been ascertained and counted. The most delicate, but at the same time the most determining experiments have been conducted, and these demonstrate that to produce the color at one end of the solar spectrum, red, 480,000,000,000,000 of these vibrations must impinge upon the retina in each second; while to produce violet, the color at the other extreme of the spectrum, the number of vibrations per second is no less than 720,000,000,000,000.

The same arguments which are applicable to the undulatory theory of the progress of light, are equally pertinent in the consideration of electricity, for its mode of progression has been shown to be nearly allied to that of light.

And now, let us for a moment consider the characteristics of some of these forces. Sir Humphry Davy says that the immediate cause of the phenomena of heat is motion, and the laws of its communication are precisely the same as the laws of the communication of motion. We know that all molecular motion is accompanied by the evolution of heat to a greater or less degree. This is equally true whether it be of the changes incited by what is known as chemical action, or the motion induced within the mass of iron upon the blacksmith's anvil. We also know that the same molecular disturbance generates what is known as electricity, and that both these elements are operative in inducing that change sometimes called chemism. It is equally true that each of these forces is convertible into any of the others. Thus, if we commence with chemical action, we all know how, within the cells of the battery, this action is made manifest in the electrical current, and thus chemical force is converted into electrical force. If now this force be generated in sufficient quantities and conducted along a wire of sufficient size for its easy transportation, and if in this "circuit" a piece of small platinum wire of such size as to partially obstruct the "current" be inserted, we all know that the platinum wire soon becomes red-hot, and we

see an instance of the conversion of electrical force into heat. The galvano-cautery is an illustration of this. If now the current be increased, and the obstruction be entire at one point, the most dazzling radiance is manifest, and here we have an example of the conversion of electricity into light. The electric light is an illustration of this.

Here, then, commencing with that simple molecular disturbance within the battery, we see the force generated by those movements manifested first as chemical action; this is converted into electricity, the electricity into heat, and the heat into light, and all without the addition to or the substraction from the original force, as first made manifest, of anything whatever. This proves conclusively that whatever name we may give the phenomena exhibited, they are all due to the same cause, have the same origin, are convertible the one into the other, are in fact all the same thing, differing only in the mode of their manifestation and the accompanying phenomena.

The sun is the great source of light and heat for this earth. The so-called rays of the sun may be made manifest to us in many different ways. If, for instance, we take our stand with that body exposed directly overhead, its influence is chiefly exhibited to us through that which we call heat. But we may interpose between us and the sun crystals of alum, and these will intercept those undulations which are known to us as heat, or in other words, it will so change the character of these vibrations that the sun's influence is no longer manifest to us as heat, but the heat-rays have become light-beams. In other words, the heat is converted into light. Again, we may interpose another substance, and there is neither heat nor light in the sun's influence, but its rays now induce those molecular changes which we know as chemical action. Thus the same rays of the sun may be changed and made manifest to us as light, heat, chemism, or electricity.

Force, then, is but a mode of motion, and according to the manner in which it is manifest to our senses we call it by the names which I have considered. But force may remain latent for an indefinite time. In my school-boy days, when we considered heat, or caloric, we called it either sensible or latent. Further study will teach us that such terms are the result of our lack of understanding of the subject. There may, in one sense, be such a thing as latent force, but heat is only a method of the manifestation of force. The sun is, as I have said, the origin of all force, because within its body certain changes were originally organized and put in motion, whether by Omnipotent power, as our system of theology teaches, or

by inherent qualities, as materialists claim, it matters not in this connection. These molecular changes are the origin of the unit force. The effects of these changes are eternal, imperishable, indestructible. But they are not necessarily incessant. They may be stored up, imprisoned, only to be liberated through the transference of some other influence. As thus: in the early carboniferous ages the force liberated through the changes going on within the sphere of the sun being manifested upon the earth as light, heat, and chemism, induced certain molecular changes here, which resulted in the new combination of the elements of matter then existent, and the consequence was an extraordinary organic growth, and the formation of the carboniferous forests. The continued force, which had its initial point in the sun, still active, but modified by previous changes of the same matter, and by self-limiting, environing circumstances, finally resulted in those immense carbon deposits which to-day form our coal-fields. The coal which burns in my grate is but the imprisoned force which was originally derived from the sun, and which came in the form of light, heat, electrical, and chemical changes. For proofs of this we have but to subject it to favorable influences and there will be returned to nature the same identical light, heat, chemical, and electrical forces which so long lay inactive, dormant, latent, imprisoned within the coal-bed. It is capable of demonstration that the amount returned is the exact amount so long ago received from the sun. But the light, heat, etc., or in other words, the force liberated in my grate is not lost or wasted, but is absorbed, appropriated, perhaps imprisoned within other masses of matter, to be in turn again yielded up and again utilized. Or, perhaps the force so eliminated from the coal is at once made manifest in some other mode of motion, and thus transmitted on and on, now exhibited as heat, now as electricity, and again as light or chemical affinity.

I might enumerate very many instances wherein one manifestation of the unit force is changed into another. I might speak of the heat, the light, and the electricity which in various ways accompany or are the result of all chemical action.

I might show that electricity and light and chemical action are ever attendant upon the development of heat, and that heat and light and electricity are the accompaniments of the development of chemical action; but it is all summed up in the declaration that all movements of matter, in whatsoever way they may be brought about, are producers of the unit force in some one or more of the methods of its manifestation. I cannot open or shut my jack-knife without

the evolution of heat and electricity in greater or less degree. If I bring the blade of my knife in quick, sharp contact with another substance sufficiently hard and brittle, heat and light are made evident to the senses, as in the use of the flint and steel.

The evolution of force and its methods of manifestation are controlled by definite laws, which are as yet in a great degree unknown to us. Prof. Grove says that the law or rule as to the production of heat or electricity from friction or percussion is that when the mutually impinging bodies are homogeneous, heat is the consequence; but when they are heterogeneous, electricity is evolved, although either is in a greater or less degree the constant accompaniment of the evolution of the other. In fact, it is true that the production of one force or mode of motion is, as a rule, accompanied by more or less of the others. The beautiful photographic process, which is but the conversion of light into the molecular motion commonly known as chemical action, is accompanied by the evolution of heat and electricity, though in quantity not appreciable to anything but the most delicate apparatus. If I bend a poker across a chair-back the molecular disturbance of the iron, if it be measured by thermometers and electrometers of sufficient delicacy, will distinctly show an alteration in temperature and electrical condition, and this is true of every change in the relation of the atoms which go to make up matter.

Matter is composed mainly of four simple elements—oxygen, hydrogen, nitrogen, and carbon. Of these four three are gaseous, and their atoms move freely and with little friction. Many of the compounds of these elements are what are called allotropic, or isomeric—that is, two bodies are composed of exactly the same number of atoms of each element, and yet they are totally unlike, because the *relation* of the atoms is not the same. Thus the oils of turpentine, lemon, and juniper are chemically the same, yet physically different. So that it is seen that very slight atomic or molecular changes produce wide divergences in the character of compounds. Then, too, there is abundant opportunity for such changes to be brought about by a very slight exertion of force. The compounds of nitrogen (and this includes all the so-called albuminoids) are very mutable, and are ever seeking for some more permanent union. The exhibition of the slightest force is sufficient to induce a disruption of imprisoned chemical affinities, which may result in wide changes.

Again, compounded matter exists in a number of forms, as gaseous, liquid, and solid. Of these the first two are easily impressed, and

molecular changes are constantly going on. Solid matter exists in two different states—the colloid and the crystalloid. Of these the first is unstable and exceedingly mutable. So that of all the forms in which matter exists, there is but one in which it is not easily changed and made to assume new molecular conditions. We have shown that every such molecular disturbance, however induced, is followed by the evolution or the transference of some one or more of the various manifestations of force. Given, then, that most forms of matter readily undergo molecular and other changes, and that the manifestations of existent force, such as light, heat, chemism, etc., are constantly active, and that such action can only result in still another transference of force, it may readily be seen how unceasing must be the phenomena presented by all these mutations and mutually-induced changes. Every wave of force exerted at the initial period of this universe has been since that time and ever will be existent, and either constantly, actively exerted, or passively imprisoned by superior force. Matter is, under the action of force, constantly being disintegrated and its constituent particles built anew into fresh forms. And so this tearing down and redistribution of matter is, under the dominion of force, constantly going on. Every organized being, whether animal or vegetable, has its period of molecular aggregation, of growth and so-called nutrition, of active, progressive changes, and then the same forces which have resulted in the combination of the molecules which make up its substance, are again active in those yet further molecular changes which bring about its morphological destruction. I say the same forces which brought together the molecules which compose this body of mine, will in time insure their separation, and thus bring about the disintegration of solid and fluid tissues, and return them again to the common stock of matter, while the energies which brought about these definitive changes, through the reaction of the matter thus metamorphosed, will in turn be transformed into other forces, and itself returned again to the parent or unit force whence it was segregated, and thus will all that which goes to make up this Ego, this individual I, be returned again to that great source from which it emanated.

If this doctrine of the unity and the correlation of forces be admitted as true in its application to the various forces of which we have been speaking, are we not justified in assuming that the law is general throughout the material universe? And whether we study this unity as exhibited in the macro-cosmos, or in the micro-

cosmos—in the revolutions of solar systems, or in that affinity which binds together two atoms; in those early convulsions which resulted in the upheaval of continents, or in the change which culminates in the growth of a blade of grass; in the devastating earthquake, or in the fall of a leaf in autumn; in the whirling in infinite space of a planet, or in the infinitesimal vibrations of a ray of light; in the action of volcanic fires, or in the molecular changes within the single battery-cell,—we shall see that in any extreme it unfailingly exhibits the same characteristics. It is the exhibition of the same force which results in the molecular aggregation called man, and that of the lowest organic life. Within the two organizations constant molecular changes are going on that differ but in degree. The results of those changes in the two are precisely alike in fact. Life—vitality—in the one is, in a physical sense, precisely what it is in the other, except that in the lower it is simple, and all the processes are elementary; in the higher it is complex, and not readily comprehended.

And now, having considered the law of the correlation of forces in its application to the lower forms of matter, shall we stop when we are just upon the threshold of the secret places of nature? We have shown that in inorganic life the law prevails and explains all the phenomena there exhibited; shall we admit that the harmonies of nature become discords when they are played upon the strings of a more perfect instrument? As we rise in the scale of existence shall we conclude that, where before all was beauty and harmony and exactness, now all becomes discord and falsehood and incongruity? Shall we admit that the laws which are universal in the lower objects are suspended when we arrive at the point where they are most needed to make things congruous? The world has long accepted as a fact the belief that man is a law unto himself, and that his physical being is not subject to the rules which govern all the rest of creation. The life of one of the lower animals was thought to be one thing, that of man to partake of a very different essence; that the vitality of the shrub which grows by the wayside had no kind of resemblance to the flower which blooms in our gardens. Let us look into this thing.

My subject, as announced, is Nervous Force. Perhaps many of you have wondered if I were to pay it the respect of a passing glance, and if so what my long prelude meant. It was necessary that I first establish and make clear to your comprehension the doctrine of the correlation of forces before I attempted to apply it to other and higher uses.

We have seen that the light and heat of the sun, under favoring conditions, have developed or been transformed into other forces. We have examined those forces, and have found them a unit in their origin, though diverse in their mode of manifestation. We have seen that light may be changed into heat, heat into electricity, and that into chemical affinity; that all these so-called forces are mutually interchangeable, alike, identical; that each is the result of certain molecular changes, themselves induced by manifestations of other varieties of the unit force. We know that all organic bodies, whether of low or high degree, are composed of the same atoms that unite to form other matter, and therefore they must be amenable to the same laws.

There are certain phenomena connected with living matter called vital phenomena. Under the old hypothesis, that there were many kinds of force, and that each was an entity, acting in an independent manner upon such matter as was subject to its influence—it was easy to suppose that nervous force was a something distinct and by itself, and that it was not subject to the laws which governed other forces. When it was believed that magnetic attraction was a pervading something which established a kind of affection between certain substances, and aversion toward others, and that this attraction was a thing by itself, dominated only by its own laws, and owing no allegiance to the ordinances which governed the relations of other matter, then it was easy to imagine that nervous force was a principle alike distinct, separate, and removed from all other dominant forces. In that early day there was no harmony in nature, but a continual clashing and discord among mutually-contending forces. Let us now suppose that nervous impulse is but another mode of manifestation of the unit parent force, and how quickly all becomes harmony and beauty.

The lapse of time admonishes me that I cannot pursue this inquiry with all the minuteness with which I endeavored to examine the physical forces; but that *all* force is identical, interchangeable and the same, seems to me plain for a number of reasons. In the first place, it is derived from the same source. The same molecular changes and mutations which in the battery-cell result in the evolution, or more strictly speaking, the segregation, of electrical force, are here manifest as nervous force. We are constantly supplying the elements of this nervous battery in the food which we take, and those molecular changes which we denominate digestion and assimilation result as such changes ever do and must result, in the elimination of a

force which, in this method of manifestation, we call nervous force.

If an animal be deprived of every kind of food except fats, it finally dies of inanition, though there is no apparent emaciation. The changes incident and necessary to nutrition cannot be carried on in the absence of necessary elements. The molecular changes of the digestive process having partially ceased, there is a consequent diminution in the evolution of nervous force, which finally results in complete functional stasis, or death.

Again, that nervous force is identical with the other forces is manifest from the fact that in many of its phenomena it is the same. As light and heat are modified by other forces as well as by the circumstances under which they are made manifest, so nervous force is dominated by the environments which surround its elimination and exhibition. The methods in which the changes which result in light and heat progress, the elements taking part in such changes, all have an influence upon the characteristics of the force so generated. This is also true of nervous force. When the molecular changes going on within the body in which is generated nervous force are most active, the force generated is greatest. When these changes cease, nervous force is no longer generated and the body is dead. When the products of these changes are for any reason transformed into heat, as in certain pathological conditions like fevers and inflammations, nervous force is decreased. If the body be subjected to intense cold, the transformation of these changes into force is retarded, and not only is the temperature of the body reduced, but nervous force is diminished, and the organs which are controlled and regulated by it become torpid. Certain drugs have the power entirely to suspend these transferences of force, or to modify them greatly. So in the generation of other forces through the chemical or other changes which induce them, the elimination or action may be modified or suspended by the introduction of interfering matter.

Nervous force may be changed into other forces, and on the other hand, light, heat, and electricity may be transformed into nervous force. It is not sufficient that the tadpole be furnished with the necessary food and heat for its development into a frog. Unless light be given him he remains in his tadpole state. If heat be not applied to the freezing animal there will be no nervous force; and how familiar is every physician with the fact that when nervous force seems exhausted, the mere application of heat supplies the

needed nervous impulse—how else than by a transference of the force? If I apply the poles of a powerful battery to the nerves of an animal in which the evolution of nervous force is quite suspended, all the effects of that force are manifested. The heart can be made to beat, and any special muscle to act as in life, for a limited time—how else than by the transference of this mode of manifestation of the unit force? Electricity seems more nearly correlated to nervous force than is any other mode of motion. Indeed, in some animals they seem interchangeable at will. Thus the gymnotus, or electrical eel, by the possession of a more than usually complicated nervous apparatus, can give electrical shocks of considerable power at volition.

The fire-flies and glow-worms are also provided with special organs, by means of which they can emit light at will, as the gymnotus does electricity; that is, nervous force is transmuted into light. In all such animals when nervous force is exhausted, when they are tired out by continued irritation or excitement, this power to emit light or electricity is gone, and it only returns when the nervous impulse is again perfect.

The laws which govern the manifestation of nerve-force are less understood than those dominating the other forces. The force itself seems like an algebraic expression to be raised to a higher power, but that it therefore differs from the others does not follow. When in the light of the theory of the correlation of forces it is intelligently studied, we may hope that its phenomena will be better understood, and its conservation become a wrought-out problem. We have learned how electricity may be stored up,—imprisoned against a time of need. Why should we not discover the same thing concerning its nearly-related nervous force? When the battery ceases to work we know how, within certain limits, to remedy the defect. What hinders our learning the same thing of the nervous system? Many men have striven to gain this knowledge, but not, so far as I know, in the light of the latest revelations of science. Nervous force has been regarded, as electricity once was, as an entity, an entirety, as something distinct from other forces. It is time that men began its investigation from another stand-point.

In the first pages of this hastily-written paper I said that the progression of force is, so far as we now know, by undulations and onward, wave-like motions. This is demonstrated by experiment to be true of nervous force. Even the rate of this advance has been determinately measured, and found to be in the motor nerves about

110, and in the sensory nerves about 140 feet per second; so that we see in its mode of progression it obeys the law governing other forces.

Of the manner in which nerve-force is eliminated we know little, but that it is in some way through the nervous centres we are convinced. Experiment has proved this, and at the same time established the fact of its close correlation with the other forces. When the nerve-centres are destroyed or paralyzed, not only is the production of nerve-force stopped, but the body quickly cools. Upon sending a current of electricity along the course of the nerves, the bodily heat or temperature rises, so closely are these forces connected. If an organic body be deprived of light, not only is nervous force diminished, but the temperature is lowered.

We have all known persons whose hair during conditions of nervous excitement would stand on end, and from whom at such times could be drawn distinct electric shocks. I know a man who, by inducing a restless, agitated, nervous state, in favorable atmospheric conditions, can light a gas-jet by simply holding his finger-tips to the burner. These states are always succeeded by nervous depression, undoubtedly due to a loss of nervous power, through its transmutation into electrical force.

That nervous force is very closely correlated with electrical force is again proved by the fact that all persons of highly-wrought nervous organization suffer extremely during electrical disturbances. So-called magnetic storms induce a condition of great nervous exaltation in many people. Nervously anæmic people derive strength from a gentle electric current, because of its conversion into nervous power. People who suffer from nervous irritability find an exacerbation in electricity. That is, when the lesion is of the nerve-centres,—the generators of nerve-force,—electricity is beneficial; when in the conducting nerve-filaments, it is aggravative, for obvious reasons.

There are many other points and arguments which I should be glad to present, but this paper is already too long, and I must leave the consideration of the subject. I desired to say something concerning a kind of nervous ebb and flow in certain members of the vegetable kingdom—to speak of the stinging nettles and of certain jelly-fishes, which without a discoverable nervous system yet give distinct shocks through some occult means—to speak further of the inordinate waste of nervous force in certain states of excitement or passion—to say something about the anatomy of the nervous system, and to examine a little the phenomena of excessive nervous irritability. I

am even leaving almost untouched one great division of my subject—nervous lesions. I can only plead the vastness of the theme, and the impossibility of doing more than to make a brief presentation of it within the limits of a paper like this.

The importance of a more careful study of the physiology of nervous force is apparent when we remember that the type of American diseases is distinctly nervous, and that from year to year it is growing more so. Reflecting men in the medical profession have begun to recognize that we are making little progress in learning to combat these ills, and they are seriously looking about for the reason. Some of the most profound thinkers in medicine have turned their attention almost exclusively to this field. They have advanced little further than to discover the cause of certain troubles, and lament the inability of the profession to grapple with and overcome the difficulty. Books have been written which have stirred medical men up to a recognition of the importance of this subject, without convincing their authors that they themselves fully comprehended the matter. Is it not time that investigation began from a new stand-point? Is it not time that inquiry took another direction? If any one has studied the subject from the vantage-ground of the correlation of nervous impulse with the other forces, I am not aware of it, but I hope that this may be a door which shall enable some one to enter upon a field that will give richer returns than any have yet yielded.

DISCUSSIONS.

Dr. BUCKINGHAM: I only wish to mention a point or two. When we consider the physical growth of life, we can, to a certain extent, reason. When we get beyond the physical facts and enter the field of speculation, we cannot understand the subject. The machinery may be in perfect order, and yet if you apply electricity to it you cannot make a dead man hear or you cannot make a dead man see. There is something beyond which we do not understand; how far we may travel in that line of knowledge after awhile we cannot say, but there is a border beyond which at present we cannot pass. I do not wish to occupy any of the time, but merely to state that this discussion has not settled the matter. As for the conversion of one motion into another one, or the correlation of forces, I doubt very much if that theory is correct.

SECTION I.

ARTIFICIAL DENTISTRY, METALLURGY, AND CHEMISTRY.

PAPER BY T. L. BUCKINGHAM, CHAIRMAN OF THE SECTION.

IF it was the intention when this Association was divided into Sections, to have the chairman confine his report to new improvements, discoveries, or additions made in the branch during the previous year, and were I now to comply with such intention, I should make my report very short, for I do not think any decided improvement has been made, though there has been a gradual advance.

With the introduction of rubber as a base, and of sectional blocks made by the manufacturers, the old process of mounting teeth on metallic plates was in a great measure discontinued. While the new process was, to some extent, an improvement on the old, it prevented the advancement which would have taken place had it not been introduced. It requires much skill and nice workmanship to mount a set of teeth on a metallic plate; and when the teeth have to be carved, burned, and ground to fit, and arranged to give the proper expression to the face, it requires more than ordinary skill to perform the task properly. Teeth are now manufactured in quantities, and all that is required of the dentist is to select such as will come nearest to suiting the case. The fitting to the plate is dispensed with; in fact he does not want them to fit closely to the gum, because the rubber will fill the space. All he has to do is to make close joints and finish smoothly. He may vary the color and size for the different cases and make some a little longer or shorter than others, but they all have the same regular form and look as much alike as shoes, hats or other articles of dress that are sold in the stores.

Natural teeth vary in shape, size, color, and arrangement. If you were to examine all the mouths in this city you could not find two exactly alike, and one of our objects in inserting artificial teeth is to imitate nature. It is therefore evident that teeth made in sectional blocks and arranged as they have to be in regular order cannot imitate natural ones.

Why cannot artificial teeth be made to resemble natural ones? The shape, size, color, and arrangement are under our control. To obtain the best results we must not use sectional blocks,—we must have single teeth. Let us see what is within the reach of every dentist who has talent enough to accomplish what he undertakes in artificial dentistry.

First, we have the porcelain composition, which can be made to imitate the natural teeth so nearly that they cannot be told at a very short distance. We have also compositions to imitate the gum near enough to avoid detection. With these we ought to be able to construct teeth that would very nearly resemble the natural ones. Single teeth are also made, very closely resembling the natural organs. In making molds for them the manufacturer selects the best-shaped natural teeth for patterns, and the color is very near like that of good, healthy natural ones. But natural teeth are not always regular in shape, nor are they always uniform in color in the same mouth, and by use they are worn on the cutting edges of the front and the grinding surfaces of the back teeth; so that in a person's mouth of over forty the teeth present a very different appearance from what they did at eighteen or twenty years of age.

As it is our object to represent the natural organs as near as possible, we should grind the teeth off as much as natural ones are worn. The practice is not to grind the teeth on the cutting or grinding surfaces. I say grind them all over if necessary; make them the shape you want; then if the ground surface is polished with pumice on a buff and finished with rotten-stone and oil, a better surface can be made than they possessed when they were burned. Ash & Sons polish their teeth and in doing so give a much more natural surface; so by grinding and polishing we can make single teeth any shape we wish.

In regard to the color, it is sometimes impossible, with all the varieties there are in the depots, to match the color of some natural teeth. By selecting such as have the color of the body of the natural tooth and using some mineral paint, a tooth can be made to match almost any natural one. Porcelain painting is now so common that the prepared colors can be purchased at any store where they keep artists' materials. Forty years ago they painted all porcelain teeth. When first burned they came out as white as beans and of nearly the same shape. They were then painted and burned again.

In setting an artificial tooth alongside a natural one that has been badly decayed and filled, and perhaps is black on the side opposite

the filling, the neck green and the edge blue,—it is impossible to match such a tooth unless we color one. If a tooth is selected of the color of the body of the natural one, ground and fitted to correspond in size and shape, and then painted to match, it may be made to imitate the natural tooth so closely as not to be detected. The painting may be done by any dentist who has skill and taste enough to make a good set of teeth. The mineral colors change very little in burning, unless they are heated much more than is necessary. The burning may be done in a muffle; one of the small furnaces used to make continuous-gum work is the best. If the dentist has not one of these he can use a clean crucible, heating the teeth to a full red heat in an ordinary fire; or they may be burned on a piece of charcoal with a blow-pipe, using a naked flame. All that is required is to heat to nearly the melting point of silver, when the silicious compound with which the paint is mixed fuses and forms an enamel.

After selecting and preparing the teeth to suit the case, the next thing to be done is to arrange them. This requires more than ordinary talent to accomplish properly. Almost any mechanic with a few hours' instruction can put up a set of sectional blocks on a rubber base, and they will be as regular and beautiful as a row of piano-keys; but to make teeth irregular and give them a natural appearance to harmonize with the other features of the face requires the talent of an artist. The dentist should not be satisfied when he sees that the teeth are not too short nor too long, are the right color, not too large nor too small, or that they articulate properly. They may be right in all these essential points and yet have a very artificial appearance. He should take pattern after the portrait painter: commence with the patient present and notice not only the teeth, but all the expressions of the face, and arrange the teeth to harmonize with the features so as to give the best expression to them. A photographer sets his subject in a chair so as to get the best light, places the head in a fixed position and takes his picture. Everybody knows that a photograph gives no expression; it is only a picture of the person when he is in a quiet, passive condition. The portrait-painter will not only give you a picture, but will give expression to it; a little twinkle in the eye or a slight elevation of the lip is transferred to the canvas, so that you not only see the form but also the character of the person. As the artist is not always called upon to paint a beauty or persons of a similar cast of features, so with the dentist. If our patients were all alike in form and expression we might have sets made to suit them. It is not necessary for me to call your attention to the

deformity when the natural teeth are lost. The face is then shortened from one to two inches, the lips fall in and the chin comes up to meet the point of the nose, and every muscle of the face below the orbit is changed. Persons who have lost their teeth cannot smile or give a pleasant expression, their cheeks are wrinkled, they have no lateral motion to the under jaw, and in eating they can only roll the food into masses and swallow it without mastication. In fact they would be horrible to look at if we were not so accustomed to seeing them. A writer who is well informed estimates that there are twenty million teeth extracted in this country every year, and at least eight million of artificial ones made. When we consider the various expressions of feeling shown by the face, and the importance of the teeth in speaking and mastication, we may form some estimate of the necessity of replacing them when lost.

In using single teeth it is necessary to have some substitute for the gum. We have two such that answer the purpose well—the continupus-gum body and celluloid. Continuous-gum work has been before the profession so long and its merits have been so highly extolled that I shall give it not more than mention. It certainly makes the most perfect work when it can be used; but there are objections to it—it is heavy, liable to break, and not easily repaired. It has been in use more than thirty years, during which time it has been tried by many who have discarded it, and its use does not appear to be increasing.

Celluloid, when properly made, answers the purpose well. It is cheap, more easily managed, lighter, can be easily repaired, and may be made to imitate the natural gum very closely. It is not necessary to give the chemical composition of this compound. It is known to be made from gun-cotton by adding camphor and some oxide of zinc; a little vermilion is also added to give it color. It softens to a doughy consistence at a temperature of 300° F., when it may be pressed in molds to any shape.

The first step in arranging the teeth is to obtain a base-plate. Wax is used, but it is too soft in the mouth. Wax and paraffine in equal parts, colored with alkanet root make a good plate; gutta-percha and modelling compound are also used, but the best and most satisfactory is a metallic base-plate. It is not much trouble to make, and it will retain its shape and will show if the impression of the mouth is correct. Here we should stop until the plate is a satisfactory adaptation. When this is acccomplished we may arrange the teeth on it by means of paraffine and wax. If the operator will take the

trouble he can make the case just as it is wanted when finished. The wax is covered with tin foil, worked into place with a burnisher. Rugæ may be made in the wax on the palatine part so as to give a more natural feel to the tongue. The tin foil may be stippled to give a granular appearance. By having the wax covered with foil on both the outside and the palatine surface and making the case on a metal cast, it will require very little finishing after it is pressed.

Single teeth mounted on a gold plate, using celluloid to attach them and to form the gum, makes one of the most satisfactory cases for both the operator and the patient.

In working celluloid many fail from not having a suitable apparatus and from not taking sufficient care. It will soften at 212° F., and it may be pressed into shape at that temperature by using sufficient force. I have known it to be worked with boiling water in an open vessel, but it is only forced into shape and then has a tendency to spring; such cases get out of shape very soon. I have some specimens to show the effects of different temperatures on it. It should be heated to a temperature of 300° F. At this point it is in a doughy condition and may be molded into any form, with the certainty of its retaining its shape when cold, and with no liability to spring.

SECTION 1.—Continued.

The Ill Results Produced by the Use of Artificial Dentures upon Plastic Bases.

PAPER BY WILLIAM H. DORRANCE, OF THE SECTION.

IT is a sad and incontrovertible fact, that that disease which comes frequently under the notice of the dentist, known as dental caries, is universally prevalent, and is thought by careful observers to be on the increase. The loss of teeth resulting from other causes, particularly calculus in its various forms, is also appalling.

Though much painstaking effort on the part of members of the profession has been directed to the diffusing of practical information relative to the proper care of the teeth and the pressing need of their salvation, much more has been said and done that is not only fallacious and harmful, but, in view of the high importance

of each member of the oral apparatus to the human economy, absolutely (though perhaps ignorantly) criminal. That the public at large, even highly intelligent and cultivated portions of it, are apathetically lacking in appreciative knowledge of the important functions of the teeth, and consequently indifferent to their loss or efficient restoration, is not surprising, when it is taken into consideration that the great majority of those who, by reason of their claim of membership in the dental profession, should know, are yet to become properly educated in the matter.

While the representative portion of the profession has been steadily advancing in the treatment of diseased conditions and in a knowledge of therapeutics, and may be said to be making headway in oral surgery; while it is becoming—nay, has become—justly noted for superior excellence in all operations upon the natural teeth, it has not made corresponding advancement, but has rather retrograded in the equally important department of dental prosthetics.

The reputation of a person is determined by his acts, and that of a profession is established by the abilities and activities of its members. In the rapid stride of those who are (by the process of "natural selection") placing themselves in the front as operative specialists, and of those whose love for the work has led them to devote themselves to the investigation of proximate causes, there has been, it is to be greatly regretted, a noticeable lack of any thought or care for prosthetic dentistry, with a consequent debasement of it, and desire of divorcement from it. On the other hand, the short-sighted and time-serving indifference with which assistants have been chosen, or so-called students admitted to the offices of reputable practitioners, and without subsequent preparation or direction of value and with scarcely a glance at a text-book during the few short months of their stay, have been carelessly allowed to launch out as members of the profession (and come to be recognized as such by the too indifferent and pre-occupied public), has been the means of bringing to the ranks of the profession the men who, as numbers go, constitute the bulk of it, and into whose hands prosthetic dentistry has been largely allowed to fall. These, in the exigencies of the matter, have no thought or care for the advancement of the profession, or the amelioration of the condition of suffering humanity, save as it is to the present interest of their pockets. And hence we have a profession that, whatever its claims to advanced standing, has in its representative membership been gradually losing sight of, or, perhaps, has rather lost interest in observing and investigating not only the me-

chanical, but also the physiological and esthetic principles involved in the construction of an artificial denture, which shall as perfectly meet the requirements as it is possible for human skill to provide, and consequently has neither the skill nor the judgment to properly advise patients in the matter.

But there are other causes for failure of advancement in dental prosthetics. With the introduction of plastic (or vegetable) bases for the support of artificial dentures came a new era. Those who were previously unable on the score of expense to have lost organs replaced, and those who valued absence of pain rather than the presence of natural teeth, began to think that they too might have artificial substitutes, and thousands of such have been supplied with substitutes upon plastic bases.

Dentists who had been in the habit of putting much skill into the construction and fitting of gold and other metallic plates allowed the ease of manipulation which was soon acquired, and the lowness of cost of rubber work to mislead them into what has proved the error of recommending it to their trusting patients as the best for them. That same fatal ease not only led to vastly inferior work, but to the indiscriminate and greater loss of valuable natural teeth, millions of which are now annually sacrificed to be replaced with teeth upon plastic bases. One of the results of this growing evil is that the great majority of those whose increasing reputation for professional skill should have made them especially solicitous to give their patients the best of advice and service, have gradually been relegating this important part of their duty to the inefficient care of those whose only apparent claim to be called dentists is that they can make rubber or celluloid plates.

It is true there are those whose best efforts have been and are devoted to elevating prosthetic dentistry, and their names are shining marks, but quite like angels' visits.

As a natural sequence of this apathy in regard to, and manifest desire to get away from prosthetic dentistry, on the part of what is termed the representative part of the profession, it has been heavily handicapped in its strife for higher life and position by dragging the dead-weight of those whose best efforts only serve to degrade an honorable profession to a plane below that of a reputable trade, abundant proof of which is seen in the efforts of what is to-day known as "cheap" dentistry.

Having noticed thus briefly what the introduction of plastic work has done for the profession, let us consider if there is anything in

the use or abuse of these bases bearing upon our duties to our patients as conservators of their health and physical well-being.

The qualities which principally have brought rubber and celluloid into such general and almost exclusive use may be very briefly stated: Rubber is easy of manipulation and cheap. Celluloid is inferior to rubber in these respects, but has the fickle superiority of better color. The first quality has made it possible for the veriest tyro (whose name is legion) to make what can only by an extreme stretch of courtesy be called a set of teeth. The second has made possible to thousands (whose sore need did not by any means give them the knowledge on which to base sound judgment) the possession of an inferior substitute for the priceless natural organs now lost. Let us see if this multitude have been defrauded and injured in this attempt to aid them, and first briefly name the structures involved in the support of an artificial denture. In the edentulous mouth we have the superior and inferior maxillary bones, with their alveolar processes and foramens of exit for important nerves and vessels, their places of insertion for the muscles of mastication and expression, and their investiture of soft tissues with their ducts and glands; the mucous membrane with its delicate glands. It is essential that the saliva, with so much depending upon the healthy condition of its components be considered, and, where there are still left some of the natural teeth, their susceptible structure and attachments must also be taken into account.

We must inquire into the uses of the organs we seek to replace, not pausing to admire the infinite skill and wisdom manifested in the arrangement of the perfect set of natural teeth; into mastication, noting the necessity of the grinding action to the excitation of the parotid glands; insalivation, only well accomplished when the food is thoroughly masticated; vocalization or articulation—no part of the vocal apparatus being more essential to the distinct utterance of speech; we must notice the regulatory effect of a full denture upon the respiration; and also the support of the contour of the face by the teeth and their investing processes, and the important relation of the teeth to the physiognomy.

What are the principal changes that take place as the result of the loss of teeth? If that loss is partial, there is a corresponding loss of grinding and occluding surface, the perfect arch is broken, and the teeth left, having lost the support of their fellows, soon change position, and perfect occlusion is destroyed; ease and distinctness of enunciation are seriously impaired; and the absorption of the alveolus allows a corresponding sinking of the face.

Having thus briefly glanced at the principal structures and functions involved, let us see what the effect of introducing a denture on a plastic base will be. Leaving aside the mechanical irritation due to illy-fitted plates with the common deep chamber and ordnance map of ridges, and, with the assertion that it may be considered an axiom that under like conditions it is impossible to secure as perfect a fit with a plastic or a cast plate, as with a swaged plate (inasmuch as the perfectly shaped plaster model does not represent the varying texture of the mouth), let us at once consider another very serious objection to plastic bases,—that due to non-conduction. It being an essential condition of health that the heat constantly generated in the body shall pass away from its surface, its complete retention must result in death, and partial retention induce a greater or less pathological change of the part or surface involved. As the mouth is used for the reception of food and for speech, so far as thermal change is concerned it must be considered a heat-liberating surface. With the use of a vegetable plate comes a pathological condition due to non-conduction. The surface covered becomes congested, and the mucous membrane puffs up as though it were blistered; there is paralysis of the nervous supply. The mucus assumes an acid reaction, and the mucosine is coagulated and is a source of further irritation, and there is an abnormal rapidity of absorption of the alveolar process and the bone. Where natural teeth are present they soon become unhealthy and sensitive, and in spite of the utmost care the surrounding gums lose their integrity, and gradually the teeth go. The vitiated condition of the secretions soon becomes noticeable by the peculiar odor, and the plate becomes coated, and even with constant care it cannot be kept in a bearable condition.

In 211 partial and full cases observed, where upper plates upon plastic bases were worn, 165 of which were rubber and 46 celluloid, 47 per cent. have shown these effects in an aggravated form. In 91 per cent. these effects were marked, and in the remaining 9 per cent. there was no noticeable ill result. In three cases there was marked sloughing of tissue, with necrosis of bone. By estimation (as there was a failure to keep a complete record) the average time of use was two and two-thirds years. It is true that in many cases there was the complication of mechanical irritation due to the outrageous means used to secure retention of the dentures. In the observation of something over fifty lower cases (of the same patients), while some of the effects produced by the upper plates have not been quite so marked, a careful comparison with cases where metal plates or none

at all were worn, has led to the belief that one marked effect has been the same, viz., greatly increased absorption. In many of these observed cases the congested condition extended beyond the borders of the denture to the throat, and was doubtless complicated with general pathological conditions.

Now, without going into a statement of the difficulties—nay, impossibilities—in the way of accomplishment of esthetical results with rubber, or into the short life of the same results as apparently secured by celluloid, and without discussing the inherent tendency to uncleanliness, let us ask if the same effects are found as the result of the use of dentures based upon some conducting material. Of the 211 cases before noted, 126 have been replaced with metallic plates after such treatment as might be available. Of this number of cases enough have been under observation to give a fair estimate of the value of the change, and the least that may be said is that the improvement is marked. In many of them the return to health has produced such a shrinkage of the mucous membrane and the gums as to necessitate the refitting of the case in a few months' time. In all cases the patient has expressed a greater or less degree of appreciation of and gratification at the pleasant change.

These observations, show the necessity of conduction, and so far as they go, prove that vegetable bases are injurious and should not be used, and bring us squarely to face the fact that if we would do justice to those of our patients who are in need of artificial substitutes, we must see that they are intelligently supplied with such as will do them the least injury and secure the best results; and the profession certainly places itself in a very bad light before its own conscience, if it refuses to take cognizance of that branch of its activities which clearly cannot with any show of justice or shadow of excuse be cut away from its perfect whole without seriously crippling its integrity.

DISCUSSIONS.

Dr. HORTON: Is the coloring matter that is used in celluloid the same that is used in red rubber?

Dr. BUCKINGHAM: Yes.

Dr. HORTON: What is the ingredient used to color black rubber?

Dr. BUCKINGHAM: Carbon.

Dr. HORTON: Is there any poisonous material in that?

Dr. BUCKINGHAM: No.

Dr. HORTON: What is the difference in the transmission of heat through rubber and through celluloid?

Dr. BUCKINGHAM: I do not know. I have never tested the conducting power of the two. I suppose probably they are nearly the same. In vegetable matter there is not much variation in the conduction of heat. There would not be sufficient difference to take into account.

Dr. HURTT: Dr. Morgan asked the question of Prof. Buckingham, during the reading of his article, if this celluloid could be taken from the metal casts if the undercuts were very deep? I was told by a gentleman who had made several hundred cases of this kind, that it can readily be done when the cases are made with plain teeth,—that you can spring them off and the celluloid will return to its original position or shape without change of the plate or the arrangement of the teeth.

Dr. BUCKINGHAM: If you should have such a case, if you put it in water and heat it to the boiling temperature you can remove the plate. If you are going to use block teeth, make the base of rubber, but if you are going to use single teeth for a full set make it of celluloid.

Dr. MORRISON: Is there any mode of manipulation by which the integrity of the color of celluloid can be preserved?

Dr. BUCKINGHAM: The color of the plates recently made has stood well in ordinary mouths. A person who smokes will color rubber or any other substance unless it be a metallic plate. Some years ago some celluloid put on the market was not good, and the material got into bad repute.

Dr. ATKINSON: I wish to speak a few words with regard to principles, and then to present you the discovery that relieves us of all difficulty attendant upon misfits and incompatibility of artificial bases. It is known that if we want to clothe a human body we have to put a non-conductor upon it to prevent the radiation of its normal heat. If we want to substitute any portion of the lost tissues of the body, it is desirable that we have that substitute conform as nearly as possible in conductive or thermal and nutrient currents to the tissues themselves. There has been a discovery of a base made by George F. Reese, which has been of the greatest satisfaction to me; and those who have used it in cases of regulating pronounce it the best base for that purpose they have ever known. I have worn everything in my own mouth that has ever been presented for artificial teeth, and I give you my word that this is the

only thing that I could forget while wearing it, the only thing that has seemed to be acceptable to the tissues, so that I did not know anything about its being in my mouth. This has cost a great deal of labor and a great deal of experiment, the difficulty having been that we were so determined to have a high karat of gold. By having too much gold we found that it became brittle. We have finally learned the proper proportion to secure the best results.

Dr. ROBINSON: I have a lining for celluloid or rubber plate that I wish to present to the Association. Two years ago I found that I was losing my mouth from inflammation and absorption from wearing black rubber, and I went to work to see if I could remedy the difficulty. I finally produced an alloy composed of platinum and tin, with a very small portion of gold, that would adhere to the plate as well as paint does to wood—I give you this illustration because it is the best I can give. I have worn it in my mouth nearly two years. This metal being fibrous has the property of mixing with the plate when the latter is warmed in such a way that it cannot be removed and does not wear off. During the last year, since I have been wearing in my own mouth plates lined with this material, I have examined, perhaps, two hundred mouths in which vegetable plates have been worn, and in almost every one of them there were large patches that were inflamed and red and soft. This is a thing that is, perhaps, worthy of your attention. I found also that this metal would weld to gold, and so I substituted it in the filling of teeth, and I have some fillings here illustrating how it works. You have in this a material that will preserve the walls of the teeth as well as gold, and you may veneer it with gold if you desire. This material will not soil or grow dark in the tooth, and will eventually take the place of amalgams, and is most excellent for filling the deciduous teeth and for starting fillings, instead of retaining-points. It will stand and do good service in all cavities with surrounding walls, and in most cases, when covered with gold, will make a filling as good or better than gold itself.

Dr. HURTT: I have been made to feel this morning as I have not for twenty years the degrading influence of what has been going on. I do not generally use very strong language, but I do wish to speak my mind here to-day on this subject, and on the proceedings at this time. I came to this Association expecting to witness the transactions of the most eminent men of this country. I expected to hear principles discussed, and to hear reports of the best things in practice that had been devised by our best men for our benefit and

for the benefit of our patrons and the rising dental students. What have we witnessed here?

THE PRESIDENT: I believe I must call the gentleman to order.

Dr. HURTT: I appeal to the American Dental Association in order that I may proceed on this subject.

THE PRESIDENT: I decide that the gentleman is not speaking upon the subject of artificial dentistry.

Dr. THOMAS: I move that Dr. Hurtt be allowed to be heard.

The motion was agreed to.

Dr. HURTT. I have been taught from the time that I entered a dentist's office not to engage in anything in the direction of mechanical dentistry that would degrade the profession. I have been taught that no man had a right to bring mechanical appliances or patented methods into an association of this character, to press their purchase upon the profession. It pains me when I find a gentleman, like Dr. William H. Atkinson, of New York City, one of those to whom I have looked for the best things in dentistry, one of the great lights of our profession in this country, coming here with circulars setting forth devices that they have introduced and patented, and now advertising and urging their claims, as has been just done before this Association. Are we a committee to sit here and judge of dental patents and materials, and to put the seal of the Association upon them? This is what I object to. What are we to expect from students if such things are allowed here? Suppose a young man from Kansas should come here with a similar article, and, under similar circumstances, attempt a thing of this kind; would the President of the Association permit it? Would the American Dental Association allow it? There are professors in dental colleges here to-day, who have taught that such practices are unprofessional, and in many instances they would not associate with those who do this kind of business.

In this great representative American Dental Association, the teaching and example should be elevating, not degrading, and such appliances or materials, if on sale, should be placed before the members of the Association through the proper advertising channels.

One thing in regard to celluloid. I have made a number of celluloid plates, and find that as a rule, men who use alcoholic liquor, cannot wear them. In several cases, I have seen from one-half to two-thirds of the plate eaten off within a year's time by the use of alcoholic liquors.

I thank you for the privilege you have accorded me.

Dr. BUCKINGHAM: I did not bring anything here to sell; I simply showed you a model and a method. I do not sell celluloid. I have a right to speak of the properties of celluloid as much as others to speak of the properties of gold. It is no humbug. I do not bring any secret compound here to show you. I simply wish to give the young men here some instructions in the use of a material that is in use. I do not say that it is the best material in use. I do not come here with quackery, or any secret process. I do not want to be classed with the men that the gentleman speaks of. I disclaim any thought of urging anything in which I have any pecuniary or proprietary right. The others may take care of themselves.

Dr. HURTT: I did not, in my remarks, have any reference to what Professor Buckingham had said or done. I merely wished to call the attention of the professors who are here to this subject, hoping that they might impress upon their students the right principles governing this question. I merely wish to assert what I believe to be the fundamental principles underlying these matters, which have been taught by many good men in our profession, and I think ought to be handed down.

THE PRESIDENT: In explanation to Dr. Hurtt, the Chair would state that he was under the impression that these gentlemen who spoke and brought these things before the Association, did so on the recommendation of the committee of the Section; otherwise he would not have permitted it.

SECTION III.

DENTAL LITERATURE AND NOMENCLATURE.

Nomenclature and Terminology.

REPORT BY W. H. ATKINSON, CHAIRMAN OF THE SECTION.

IT has been the object of this series of reports to exhibit the application of Universology and Alwato to the purposes of general scientific Nomenclature and Terminology; and to illustrate the new facilities which these recent scientific discoveries place at our disposal. It must always be borne in mind, that new things are new, and that it is not until their air of strangeness is worn off and familiarity takes the place of novelty, that we can rightly appreciate the value of fresh contributions to our store of knowledge. The object of the present report is to carry a step further forward the same general purpose.

Still, while Universology and Alwato are adapted to the furnishing of technicalities scientifically constructed for every branch of science, it is mainly the animal series of biology to which our attention is being directed in these reports; and within this, chiefly to human-body-lore; and within this, predominantly, to tissues or histology, and to this minor branch of living-things-lore especially as it converges upon the structure of the teeth and the particular objects of this Association. Universology, as such, is the science of universal classification; and Alwato, on its scientific side, is the science of the natural and appropriate namings for all the results of classification, in whatsoever department.

Within the animal series it is our well-known inheritance from past scientific discovery, that development passes through a succession of stages, from the more simple to the more complex. To Louis Agassiz we were, at no distant date back, indebted for the additional and immensely important discovery, that the successive stages of the development of the fœtus, embryologically investigated, repeat, analogically, the successive stages of the development of species in the general animal series—so that we have two parallel

series, each reflecting the light derived from its study upon that of the other; and now we have a third and similar discovery, by Stephen Pearl Andrews, to the effect that the serial development of the sounds of the human voice constituting the basis of language is another parallel series of phenomena, repeating the other two series just specified with such accuracy as precisely to apportion the sounds produced by the voice to the classes of objects requiring to be named.

The idea, then, at bottom, is that, as the entire body of nature is a grand organismus (or collection of organs), of which the particular minerals, plants, and animals (and their genera and species), and especially the human body, as the superior animal product, are the specialized organs; and as the human body is a grand organismus, on a smaller and finer, but still on a repetitory scale, of which the organs (tissues and parts) repeat and correspond to the plants and animals, or to their seriated genera and species; so, in fine, the human mouth (throat, nose, and ear—"the organs of speech") is a minor organismus, the parts and touches of which in the production of the vowel- and consonant-sounds constituting language are the particular organic products; which, again, repeat, in number and arrangement of distribution, the organs (tissues and parts) of the human body entire; and, further back, the organs of universal nature, of which the human body itself is merely one.

And further, as the result of this repetition, in these three narrowing concentric circles of organization—first affecting nature at large, then affecting the human body as a reduced picture of the whole natural world, and then affecting the mouth and its series of sounds, as a miniature of the entire body—the sounds of the human voice are precisely adapted, by nature herself, in number and arrangement, to *re-present* the number and arrangement of the parts of the human body; and so the fact becomes revealed that nature has, from the first, provided science with the true and only proper system of technicalities for every department; quite in the same way as nature has provided the laws of music, which, nevertheless, had to await their discovery by human observation to be constituted into the actual score. So, it is now discovered that the true laws of language have always been latent in the organic structure of the organs of speech; and Alwato is the one language for the whole world, which is to result from the full discovery and practical co-ordination of those laws. But, first and foremost, Alwato tenders its services as a system of scientific technicalities. Such is the connection which it has with the purposes and labors of Section III. on Nomenclature and Terminology.

Phonetics, or phonology, is the name for the science of sounds, especially as involved in the production of human speech. Upon the better understanding of phonetics has been founded the art of (steno-) phonography, or the art of rapid writing, for reporting and allied purposes. These sounds are all produced by contacts of different parts of the mouth. The deftness of these touches, and the purity and strength of the resulting sounds, are greatly dependent upon the teeth. Here is the point of connection between the science of sounds and of language entire with dentistry. Common experience teaches that the ignorance or inexpertness of the dentist often affects the voice of the patient disagreeably. This can only be properly guarded against by some knowledge of phonetics; and no auxiliary studies could be more charming and useful for the profession than the studies of phonetics and phonography. As phonography involves phonetics, any ordinary text-book of phonography would do to begin with. The field of the phonetician, of the Alwatoist, and of the dentist is, in common, the human mouth. It was the connection between phonetics and dentistry which was pointed out in the discussion last year by Dr. Waters.

But the step in advance of mere phonology, which Mr. Andrews has made, is the discovery that all the sounds of the human voice, made in speaking all languages are a limited number; that they are arranged into definite classes by nature, and that this arrangement is such that each sound or class of sounds exactly corresponds with a given tissue, organ, or aspect of the body, as a whole; so that nature herself has provided us with precisely the one, and the only possible right and adequate system of nomenclature and terminology.

But even more than this, and perhaps more important, is the fact that this mutual natural adjustment of a major organism—the human body, as the one grand organ for the production of the functions and actions of the human body,—and a minor organism—the human mouth, as the one minor organ for the production of the sounds or utterances of language,—are so completely adjusted to each other throughout, that each may be studied through the other; each mode of study correcting or proving the other, somewhat as we do a sum in arithmetic, and then "prove it" by the inverse method; that is, in other words, the arrangements of the tissues of the human body may be studied not only by direct inspection under the microscope, but also in so seemingly remote a field as that of the arrangements and meanings of the vowel- and consonant-sounds of the human voice.

And so, while Carl Heitzmann, with other microscopists, is rapidly

enlarging the field of knowledge in our domain by direct inspection, Stephen Pearl Andrews has devised and is bringing to our attention a new sort of *mental* microscope, which is applicable, in another sense, to the same department of investigation; and if the chairman of this Section has any special sphere of merit in the premises, it is, perhaps, mainly, that his own studies and scientific pursuits have been of a nature to enable him to understand in some measure both these men in the great distance and diversity of their pursuits, and to recognize the importance to our profession of our laying hold of and utilizing conjointly the results of their important labors.

We will commence our practical study for this year with the following two words and their definitions:

1. BAU,SKI (pronounced bough-skee), science of all inorganic, unliving, non-living, not-living, or dead things (excluding the "*died.*"—Elsberg).

2. VAU,SKI (pronounced vow-skee), science of all organic or living things (including the "*died.*"—Elsberg); Biology.

The latter of these two sciences has for some years past come to be pretty extensively known as biology, which includes and covers the ground collectively of botany, the science of vegetable life, and zoology, the science of animal life. (This has nothing to do with the popular use of biology to denote a branch of mesmerism). For the former of these two sciences (bau,ski) the scientific world has been until recently without any distinctive name. In the "Basic Outline of Universology," Vau,ski is called Organismology, and Bau,ski, Inorganismology. Hæckel, availing himself of the Greek negative prefix *a-* (alpha privative) has named them Biology (Vau,ski) and A-biology (Bau,ski).

The consonant-sound *b* is the thick, dull, heavy, concrete, and relatively dead lip-consonant sound; non-vibrative, and, therefore, non-vital; the *v* is also thick, dull, heavy, and concrete, but vibrative (by the tremble of the lower lip as pressed upon by the upper teeth), and, therefore, vital or *viv*-id.

The diphthong au (ah-oo) is used to summarize the eight vowel-sounds and the four leading diphthongs, including itself—in a word, the whole vowel scale. It breaks up, therefore, into twelve special vowel- (or diphthongal) sounds; and, accordingly, there are twelve sub-sciences named by the vowels. We may, however, for our present purpose, omit the diphthongs, and we may also set aside any further present consideration of Bau,ski. We shall confine our attention, therefore, to eight variations or subdivisions of Vau,ski (Biology).

The eight subdivisions of Biology now in question, depend upon the meanings of the eight vowel-sounds. The following tabular views will conduct us to them, thus:

I.

Pronunciation of the Eight Vowel-sounds.

i,	pronounced	ee, or like i in machine.
e,	"	a, or like ai in pain.
a·,	"	a flat, or like a in mare.
a,	"	ah!, or like a in far, father.
·*u*,	"	uh!, or like u in curd.
·*o*,	"	aw(e), or like o in nor.
o,	"	o, or like o in no.
u,	"	oo, or like (nearly) u in rule.

II.

Meanings of the Eight Vowels.

i, centre, THING, entity (ent-, ont-)	POINT.
e, side, SIDING OF THING, *by which it is adjoined to other thing;* whence, reciprocally, side-to-side-ness, which is RE-LATION (Lat. re- 'back' or 'inverse' and lat-us 'side'); so, side-ness and re-side-ness; branchingness, Gr. phyllon 'branch;' distribution into 'branches,' 'classes,' 'genera,' 'species'	LINE.
a·, flatness ("flat a"), as palm of hand, sole of foot, bottom or seat of body; plain, level or surface of the earth; scale, degree, lift, loft or story of any kind; transverse cover, top, cap, or roof; *horizontality*, CARDINALITY	SURFACE.
a, thick-th, heap, cumulation, mass, brawn; richness, fat, exuberance, SUBSTANCE (what stands under) and super-stance (what stands over); dimension of height-and-depth; up-and-down-ness; verticality, *perpendicularity;* whence order of ascent and descent, as of an upright column or an edifice, from bottom to top and, inversely, from top to bottom; ORDINALITY . . .	SOLIDITY.
·*u*, flux, fluidity, liquidity, current, canal	TIME.
·*o*, circumstantiveness, all-aroundness, *solidosity*, tri-dimensionality	SPACE.
o, presentment, appearance, visual forms; (Greek eidos); pro-form —Hæckel; spectro-phenomena	FORM.
u, inclination, mechanism; tendency, procedure, proclivity, movement, per-*form*-ance; mechanical phenomena	FUNCTION.

III.

The Eight Grand Sub-sciences, According with the Vowels.

I,ski (ee,skee), Ontology, science of thing and things.

E,ski (a,skee), Relatology, science of relations between or among things; classification-lore.

A·,ski (a·,skee), Cardinology (cardinarology), science of basic outlay, plan, scheme, or quasi-plan, in the organization and function of the universe or any part of the universe; transcendental science; as, Oken and Gœthe were called "transcendental anatomists" (applying philosophy in science), as contrasted with Cuvier, who was an ordinary anatomist, or an anatomist taking the ordinary or common-place views (an,a,ski,po).

A,ski (ah-skee), Ordinology (ordinarology), ordinary, every-day, usual science, as contrasted with transcendental speculation, views, doctrines, or demonstrations; substance-lore, hylology.—Elsberg.

·U,ski (uh-skee), Chronology, time-lore, distribution in time, successively, or by succession.

·O,ski (aw-skee), Chorology; space-lore, distribution locally or in space, simultaneously or by co-existences.

O,ski, Phenomenology, appearances-lore; classification by presentments or visual forms; pro-morphology; morphology.—Elsberg.

U,ski (oo-skee), Mechanics; dynamology.—Elsberg.

If, now, we prefix the consonant-sound *v* with its vibratory, vivid, and vital character, to these vocal discriminations, we confine their otherwise unlimited and broadly philosophical extension to the specific range of living objects, and the same discriminations are then repeated as departments of biology, or sub-biological sciences, thus:

IV.

The Eight Grand Departments of Biology.

Vi,ski (vee,skee), Bio-ontology, the direct study of living beings as individual objects.—Hæckel.

Ve,ski (vay,skee), Bio-relatology, phyllology.—Hæckel; the study of races, species, genera, etc.; the classification-lore of living objects, at large; ground-form, or schemative outlay-lore; theory of 'type-forms' or a 'nature of things,' as the basis of the order of being (and here of living being), biological physio-philosophy.—Oken, Gœthe, Richard Owen.

Va·,ski (va·,skee), Bio-cardinology; transcendental or sciento-philosophic treatment of biology; the general principles rather than the particular details, "general-abstract."—Comte, Spencer, Hæckel, etc.

Va,ski (vah,skee), Bio-ordinology; the ordinary or common scientific examination of living objects; the particular details rather than the general principles; special-concrete.—Cuvier; bio-hylology.—Elsberg.

V·u,ske (vuh,skee), Bio-chronology, science of the distribution of living beings in respect to their succession in time; paleontology and neo-ontology, etc.—Huxley; developmental, biogeny.—Elsberg.

V·o,ski (vaw,skee), Bio-chorology, science of the distribution of living beings in respect to their simultaneous existence, or co-existence, in space (or locally).—Huxley; existential, biography.—Elsberg.

Vo,ski, Bio- (pro-)morphology, science of the configurate presentment, form, shape, appearance, or visual contour of living beings; general descriptive biology, whether of the individual or of the species—often substituted therefore for the broader designation, Vau,ski.—Hæckel.

Vu,ski (voo,skee), Bio-dynamology.—Elsberg; bio-abstract-concretology or mechanology.—Spencer.

The term ontology, usually confined to the most recondite department of metaphysical philosophy (i,ski), is introduced into natural science, and especially into biology (vi,ski), by Ernst Hæckel, the distinguished German scientist, who opposes to it phyllology from the Greek phullon, "a branch," for the science of the class or race as contrasted with the direct study of the individual living object. There is a great objection to this latter term for us English-speaking people, from the fact that to the ear it would sound the same as philology, the science of language. If we were to adopt it, we should, I think, retain, exceptionally, the Greek *u*, in the place of the usual English substitute *y*, making ph*u*llology; but bio-relatology is far better; best of all, the Alwato, Ve,ski.

The adjective "transcendental," like the noun biology, has usually, also, been consigned to philosophy; but "transcendental *science*" is a term freely employed by Hickok; and for a time, anatomists like Oken and Gœthe, who talked of type-forms, or an ideal plan of structure back of the actual anatomy, somewhat like Plato's 'ideas' back of all real things, the ghost, the formative principle which presides over the weaving of the tissues, were known in Europe, in the last generation, as "transcendental anatomists." This point of view is a very important one, and sufficiently distinct from ordinary scientific methods to deserve a distinct designation. This is bio-cardinology, bio-cardinarology, or more simply Va·,ski.

The antithet of Va·,ski is Va,ski, the ordinary, palpable, common, or substantial branch or method of biology—bio-ordinology, bio-ordinarology, or bio-hylology (Greek hulē, "substance"). The cardinary sphere of things is much talked of in Universology, and is transcendental, and so contrasted with the ordinary sphere.

The remaining four of these eight grand branches of biological science are sufficiently characterized in the tabular exposition made of them above. The terms hylology (substance-lore), morphology (form-lore), and dynamology (force-lore), have been introduced and partially rendered familiar by Dr. Louis Elsberg, through his "Classification of the Sciences." His dynamology is virtually Spencer's abstract concretology, and both are mechanical science, in the widest acceptation of the term. To Elsberg also we are indebted for the systematic introduction of the prefix bio- for the departments of the science of living objects, and abio- for those of the science of unliving objects.

It will be seen, therefore, that what is new here is, especially, the bringing of these various discriminations together in this scale of eight, allying them with the meanings of the eight vowel-sounds, and so evolving their Alwato namings—in which the differences of the meanings of the sounds occurring in the names precisely accord with the differences in the aspects of the science named.

We are now prepared to set aside from our present range of investigation all these eight great biological sciences, except the first (Vi,ski), bio-ontology, the direct study of the individual living object; and to enter, as it were, *in*side of it; and to distribute its interior parts, *by a re-application of the same principles of distribution* which we have previously applied in the *out*side way, to the sciences themselves. It is as if coming from the study of whole numbers in arithmetic, we come at length to the consideration of the single unit, and its division into fractions, and then discover that the same numerical laws which we had applied to whole numbers are equally applicable to the fractional parts of the unit down to infinitesimals. So that the law of distribution repeats itself, or appears first outside, or objectively, and then inside, or subjectively, of the sphere of universal things, but here specifically of living objects, externally considered, or as among themselves, and then internally, or as among the several parts of the individual object. For this purpose we have only now to prefix the syllable vi-, to designate the domain, and then to use the same vowels and syllables which we have previously employed, thus:

Vi,bo (vee,bo), a living individual body (with its career).
[**Bi,bo** (bee,bo), a not-living individual body.]

Or, more definitely expressed:

Vi,bodo (vee,bodo), a living body, more specifically described.
[**Bi,bodo** (bee,bodo), a not-living body, more specifically described.]
Vi,bo(dō)b,io,ski, anatomy of living objects.
Vi,bo(dō)v,io,ski, physiology of living objects.

See close of last year's report. Huxley has shown that there is an anatomy and a physiology of not-living objects, as well as of living objects.* For these the prefix is bi-, in the place of vi-.

ABRIDGED OR CONTRACTED EXPRESSIONS.

Bau,ski (bah,oo,skee), inorganismology, *Abiology;* science of not-living things.
Vau,ski (vah,oo,skee), organismology, BIOLOGY; science of living things, and

* Lay Sermons, p. 237.

VI,BAU,SKI (for vi,bodo,b(au)io,ski), anatomy (of living things), and
VI,VAU,SKI (for vi,bodo,v(au)io,ski), physiology (of living things).

But we come now to the fact that livingness and not-livingness, are first connected and then inter-commingled with each other. The living lives from the *died*, which is its pabulum, and then dies, and so *becomes* the *died*, and again the pabulum of other living things.

So within the so-called not-living, there are everywhere evidences of life; and within the so-called living there are portions of relatively dead matter.

"Nothing that lives is alive in every part. The substance of every living thing consists of three parts:

"1. Nutrient matter or pabulum.

"2. Germinal matter, or bioplasm.

"3. Formed [and now again relatively dead] matter, or tissue, secretion and deposit." *

The capacity of Alwato to thread all these intricacies and to furnish the proper meanings for whatever exists must also be made to appear, for example, as follows:

1. Vi,au,ma, componency of living objects (pabulum in the wide philosophical sense); all the materials and requisite conditions of living beings necessary to be wrought into their constituency, as their substance or stuff (*a*), the space they occupy (·*o*), the time they endure (·*u*), etc.
2. Vi,vi,bodo, now living body.
    1. Zhi(vi)bodo, plant or vegetal object (or part of do.).
    2. Zi,bodo, animal object (whole or part).
3. Bi,vi,bodo, or bi,vi,to (-to for bodo), *died* living thing; a properly living thing from which life has now departed, as fossils, carcasses, and effete matters of all sorts.
    1. Di,vi,to, an at present dying object; moribund.
    2. Ji,vi,to, a recently or just-now living thing, a corpse.
    3. Gi,vi,to, a gone past or ancient dead-living thing; a fossil—paleontological.

1. Vi,vi,au,ma, pabulum proper, dead or died food of now living beings (or of dead living beings in their time).
2. Vi,vi,vima, germinal matter, protoplasm, bioplasm, bioplasson.
3. Bi,vi,vima, formed matter, tissue, secretion, and deposit.

Vivi,v,io,ski, microscopic anatomy, physiology, and hygiene; microscopic biology.

Vivi,vi,io, parenchyma, primary corpuscular mass.

Vivi,ve,io, prosenchyma, prolated corpuscular mass.

(Vivi,)VITO, the plastid.—Elsberg. (Cell, corpuscle.)

VIt,au,ma, pabulum of plastid.

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* Joseph Cook's Lectures on Biology, p. 77.

Vit,i,ma, granular mass.
Vit,e,ma, living thread-matter, reticulum.—Heitzmann.
Vit,a·ma, cell-walls, membraneous parts, etc.
Vit,ama, vital mass or substance.

This last is the department covered by Heitzmann, Elsberg, Bödecker, Abbott, and other pupils of Heitzmann, in their new scientific investigations and discoveries, which furnish so brilliant an addition to previous histological knowledge. The disposition of the lingual materials which Alwato furnishes for the technicalities of this new field belongs properly to the workers in it. What is here presented is, therefore, merely suggestion.

In conclusion, let us recur to, and re-state, in epitome, the four grand bases of distribution, allied with the first four vowel-sounds, thus:

i, THING (centre), individual. Singuloidity.
e, CLASS (side), species. Pluraloidity.
a·, GRADE (surface), "Place in Nature,"—Huxley. Cardinality.
a, KINGDOM (solid). (Dynasty, state.) Succession by generations. Ordinality.

SECTION III.—Continued.

Report on Dental Literature,

BY J. TAFT, OF THE SECTION.

THE history of the development, growth, and progress of dentistry and the dental profession as given in its literature is, in the main, familiar to all readers and students.

Every one having any special professional ambition or aspirations will desire to know and understand the record of events and the current of the science and art with which he stands most intimately connected. A contemplation of its rise and progress, and of the changes and vicissitudes through which it has passed, will be beneficial, as a knowledge of the past gives stimulus and strength for action in the future; and this knowledge can be gained in an adequate and definite manner only through our literature.

Tradition is no longer to be relied upon as a means of conveying historical knowledge, other and better modes of perpetuating the truths of history having been substituted.

When any particular subject is brought forward for consideration, the first inquiry usually is, what has been written upon the subject, from whom has it emanated, and how has it been presented? and this interest extends not only to what has reference to special and immediate branches of our science, but to those which are collateral as well.

Some things which are usually denominated collateral, really constitute the foundation of our science, and the manner in which these are presented is a matter of much importance to us. Indeed, the literature of any branch of study that can be made tributary to our science is of great importance and interest.

Formerly the study of the pupil and of the practitioner, was confined to the so-called *dental* books; but a great change has been wrought within the last thirty years, chiefly through the instrumentality of dental colleges. Now, the subjects to which the student is required first to give attention are anatomy, physiology, materia medica, and chemistry. And these studies are placed first by private instructors as well as colleges.

It would add much to the strength, progress, and prestige of our profession could its members keep abreast with the general sciences. It may not be practicable nor even possible for him who is burdened with the duties of a large practice to be perfectly familiar with all the scientific topics of the day, but as these subjects are now treated, one may, by careful selection, gain a general and even accurate knowledge much more easily than in former times even under the most favorable circumstances.

Every subject is now more freely and clearly discussed in the periodicals and newspapers of the day than ever before, and these are always easily obtained, so that "he who runs may read," and a ready apprehension of these constant acquisitions to knowledge is promoted by the activity of the present age, so full of competition and emulation.

The general literature of the day, perhaps more than ever before, presents thoughts, ideas, descriptions, and facts in a brief, compact form, rather than in the prolix, verbose, and argumentative way of many of the earlier writers—on scientific subjects especially.

This is pre-eminently an age of paragraphing, a time when men scan books, rather than read them, for ideas and facts. Any subject, to receive attention at the present time, must be presented in an attractive style, full of strong points and pungent effects, and above all condensed to suit the taste of a people who are living at a rate wholly unknown to our forefathers.

The rapidity of movement and the intense activity of the age in which we live have been chiefly instrumental in effecting this result.

Condensation and brevity are elements of English composition more especially, as is shown in translations made into the English from the French or German.

The aim now is, not to invest thoughts or ideas with as many, but with as few words as possible, and hence the growing importance of giving to every word a clear, definite, and as nearly as may be, a fixed signification.

While a much larger number of persons are helping to make the literature of our profession, yet that there has been great improvement is apparent.

The growing desire at the present time for a more extended and higher education, with the finer culture which must result from it gives promising indications of still further improvement in the writings as well as opinions of our various authors.

The increase in quantity of dental literature within the past three years has been, upon the whole, greater than ever before in the same period of time. Several text-books have been revised, improved, and brought to the present status of dental science and practice, among which are the following:

"Mechanical Dentistry," by Joseph Richardson, M.D., D.D.S. This as a text-book for prosthetic dentistry stands at the head of the list of all the works in the English language on this subject; it is well written; and includes almost every item of special value in this department of dental practice, while that which has become obsolete or worthless has been in the main omitted. Being better adapted to the use of the student than any other work of the kind, it has been adopted as a text-book in all dental colleges.

"Oral Surgery," by J. E. Garretson, M.D., D.D.S. This work has not only been thoroughly revised, but there has been added a large amount of original and valuable matter, and it is now a volume of about 900 pages. It is not only an important text-book for the student but an indispensable reference-book in the library of the practitioner.

"Dental Anatomy," by C. S. Tomes, the second edition of which was issued at the beginning of the present year, is a valuable work for the student, in that it occupies the ground of this special subject better than any treatise that has preceded it.

"A Manual of Dental Surgery and Pathology," by Alfred Coleman, L.R.C.P., L.D.S., etc., is a volume that has been revised and adapted

to the use of American students and practitioners by Thomas C. Stellwagen, M.D., D.D.S. It is profusely illustrated and contains much that is valuable, as a record of the results of long observation and experience must be.

"Oral Deformities and their Management," by Norman W. Kingsley, M.D., D.D.S., is a valuable addition to dental literature. It occupies a ground that has been wholly vacant hitherto, at least as to text-books, for while this subject had not been neglected the only publicity given it had been through articles in the various journals. The contents of this volume have nearly all been published in this way, but when thoroughly revised and prepared in its present form, making it available for student and practitioner, this work was at once adopted as a text-book in nearly if not all the dental colleges of the country.

"Plastics and Plastic Filling," by J. Foster Flagg, D.D.S. This is a well-written work issued within the past year. It embraces much that is of value and much about which there is great diversity of opinion. In it is given the experience, at least, of one who has devoted much time and investigation to the subject. While many points are clearly and fairly presented and discussed, there are many opinions advanced that show the positiveness and one-sided presentation of the special advocate.

These are only a small number of the books, in the English language pertaining to dental science and practice, that have been issued in the last three years.

Many of the works written in former years for our profession have for the most part attempted to cover too much ground, as for illustration, the works of Fitch, Harris, and Tomes; in which the subjects of anatomy, physiology, pathology, operative and prosthetic dentistry are all presented in one volume. This seemed to be, and no doubt was, at the time these books were written, a necessity, yet from our present stand-point it would have been better to have devoted a separate volume to each distinct subject and thus given them greater importance and made them, each, to stand out in bolder relief. Each subject could have been treated in a fuller and more satisfactory manner, and an increased number of volumes would have been added to our catalogue. One of the great needs of our profession is carefully-prepared text-books on dental science for students, for many of our best text-books do not meet the requirements of the pupil. Prepared with special reference to his wants, the subjects should be systematized and graded so that the

work of the student in this, his special education, as in any other, should be easily and regularly progressive, or ascending. There is in our literature very little that is in proper form for the student,—in the first year of his course, at least. Care should be exercised in the selection of text-books, and reference-books as well, for accuracy and clearness of statement are qualities of the first importance. Works of a controversial character are to be avoided, especially by the beginner, as they so often confuse rather than bring out the truth fully and clearly.

Books of reference for the advanced student and the practitioner should, in their turn, be free from all matter of a merely elementary character. There is therefore room, and I may say a demand for two or three distinct classes of treatise upon each branch or subject of dental science and art.

Books of an elementary nature are much needed, in addition to those we have, upon all branches of dental study and a wide field is open in this direction for the earnest, honest, and capable writers of our profession. But let no man write a book merely from a desire to become an author.

The *periodical* literature of our profession is assuming annually more and more importance, and it is, to some extent at least, trenching upon and even taking the place of our standard works. This is in some respects a misfortune, as the tendency now is to relegate our standard works to the position of reference-books merely, even those perfectly fitted for other uses.

Dental periodicals are not only increasing in number but are improving in quality.

There are now issued regularly in this country ten monthly dental journals, varying in size from thirty-two to sixty pages each, and four or five issued regularly in newspaper form; the latter are chiefly devoted to advertisements for manufacturers and dealers. These ten journals contain each month about 425 pages of matter, four-fifths of which is original, and a large proportion of this is of interest and real value to the profession, and of permanent worth, and much of only temporary interest. There is enough in each journal of real value to make every dentist who determines to be in the front rank willing to take the whole.

The first three dental journals ever published were American, and were published, one at Baltimore, the next in Cincinnati, and the next in Philadelphia. About the year 1856 the *British Journal of Dental Science* was established in London and has had a sturdy

life from that time to the present. There are now three dental journals published in London, all of much value to the profession.

There are in Paris three periodicals devoted to dental science and art; three in Germany, one in Italy, and one in Cuba. The latter two however, are mainly vehicles for translations from other journals.

From this it will be seen that the United States has a larger number of dental journals than all the world beside.

The ten dental journals of the United States contain each month 425 pages, or 5100 per year. The British journals contain 1692 pages per year, the German, 1984, the Italian and Spanish, 164, the French, 948, making in all 4824 pages. According to this estimate the periodical literature of the United States exceeds that of all other countries by 276 pages.

An important and rapidly-growing department of our literature, is found in the Transactions of our professional societies. The larger bodies, especially the National and State societies, and a few others, have published their proceedings in book form. These volumes usually contain the minutes, the papers or essays read, and the discussions upon them. In the early periods of associative work the proceedings were published only in the journals, but it was found to be impossible to do justice to the societies by this mode of recording their proceedings, and besides they were so much scattered, and intermingled, with other matter that satisfactory reference to such records was almost impossible; and still further, much of value was oftentimes omitted.

There have been published in this country about sixty volumes of Transactions of dental societies, varying in size from fifty to three hundred pages each. This body has published annually from its organization to the present time, a volume of its Transactions, and consequently has twenty-one volumes.

The Odontological Society of Great Britain, has also each year since its organization published its volumes of Transactions, and has now eighteen volumes. The dental societies of Germany are also issuing their Transactions in separate volumes. The works that have thus been issued contain some of the choicest matter of our literature, both in the matter and the manner of its presentation. The matter is usually prepared with thought and care, and with a consciousness that it will be subjected to criticism, and must stand the ordeal of free discussion.

DISCUSSIONS.

Professor Mayr. Dental journals as published at present to a large extent use the same words with a variety of meanings, so that it is many times very difficult for a careful reader to make different essays agree with each other. It seems to me that the subject of dental literature is closely connected with that of the reform of technical terms. Such terms should always have the same signification. Authors should be very careful to state what they mean by words used commonly in so many different senses. When I was so unfortunate as to be dragged into the business of editing a dental journal, I thought it would be necessary to give as an introduction to our journal a list of technical words, with the exact explanation of what we meant by them. I wish I had! Every one of you must have realized the difficulty of understanding the exact meaning of many essays. There are several dental journals published in Spain that are nothing but the English journals in the Spanish language, and the same may be said of the Italian journals. They are a reproduction of American and English journals, so that America has there a scientific influence on the Continent, which she does not have in any other branch of science.

There was another point that I had marked out as of importance, and that was with reference to text-books. Has any one of you read that little book published under the banner of Professor Flagg, of Philadelphia? I do not know if he wrote it, and I doubt if he did. There is nothing as funny in its line as that. It is said that good humor promotes digestion, and I recommend every one of you to read that book after dinner, if you are troubled with dyspepsia. In that book there are hardly a dozen scientific words that have a clear meaning. They are nothing but words, words, and empty words: a conglomeration of letters that may as well be divided anywhere else, as where they are. I hope that such books may not be adopted in our colleges.

Another point is with reference to standard books on chemistry. I think it belongs to the subject of literature, to inquire whether there exists a special chemistry for dentists, and if there exists any such book, I would warn teachers *not* to use it, because, if at the very commencement of a course you narrow the student's mind by making him believe that there is a special chemistry for dentists, another one for doctors, etc., he will learn no chemistry at all.

I have recently read the book on dental surgery and pathology, by Coleman, which is a very good work, except that the author, as it seemed to me, has neglected to notice properly the progress, in some departments, of the last ten years. Dr. Carl Heitzmann's name is mentioned rather incidentally only. The chapters added to the American edition have been thought by some to be only an advertisement of a certain firm, but I see much in them that is excellent. They are practical and give information as to where certain tools and instruments can be obtained. I consider the book valuable for students who wish to acquaint themselves, without much trouble with the topics treated in the book.

SECTION II.

DENTAL EDUCATION.

REPORT OF THE SECTION BY J. N. CROUSE, CHAIRMAN.

CAN "anything new under the sun" be written on the subject of dental education, a subject that has been so much dwelt upon in our dental literature, and so often and so much discussed in our public meetings, is a question often asked. Much, we answer, remains to be said, and more especially to be done, before our profession can hope to rank as its importance demands.

The subject is occupying much of the thought of practitioners, as is evident from the fact that in no previous year has it received so much attention in both meetings and journals as during the past year.

Some new thoughts and plans have been presented, and old ones have been re-discussed, and yet we come together in this twenty-second meeting of our American Dental Association, no nearer any definite standard as to what constitutes a thoroughly educated dentist, and with no more unanimity of action among our educators than we had years ago. Let us look for a moment at some of the reasons why it has become a positive necessity to have a definite standard of education agreed upon by our educators and indorsed by a body like the American Dental Association.

State legislation, deciding what practitioners have a right to practice in the respective States, has become quite general. These laws require certain qualifications, but all of them recognize a diploma from a reputable dental college as sufficient evidence of qualification.

Then the question arises, is it to be taken for granted that all the dental colleges now existing, and those of the future, are to be considered reputable without question, and is a diploma from any dental college to be taken as sufficient evidence of the holder's qualification to practice? If not, how is a board of examiners to decide as to what colleges are entitled to the term reputable, and what ones are they to reject as not worthy of such recognition? With no fixed standard is it not an utter impossibility to decide this question? Some of the

State boards of examiners have refused to recognize diplomas from some of our colleges, and yet the same board may recognize diplomas from other colleges that are less reputable.

Is it just to those institutions that have the cause of education at heart, to rank them with those colleges that graduate students without regard to fitness or qualification? Why not let the first named institutions form an association and fix a standard of education requisite for graduation allowing any college to join the association which is willing to come up to the standard. This would debar no college that had the interests of the profession at heart, but would effectually exclude those that are gotten up from selfish or unworthy motives. How radical the requirements should be would, of course, be a matter for discussion, to be decided at a conference of the faculties of the different institutions. Your Section believe that the association thus formed could well afford to require all colleges to give at least two full courses of lectures before graduation.

There have been considerable discussion and unfavorable criticism on this point, growing out of the resolutions passed by this body refusing representation to any college faculty that did not require two full courses of lectures. We cannot understand why a system that is working so much injury to the cause of dental education in general should be continued on account of the hardship its discontinuance or a radical change might cause in a few individual cases. Where one student spends more time than is necessary in fitting himself for practice, fifty would be greatly benefited by spending more time in school. To allow a student to graduate on one course of lectures, and that after a very short one, is to lower very materially the average education of our graduates, and to lessen decidedly the value of a diploma as evidence of qualification.

Could such an association as has been suggested by your Section be formed, and the two years' course be adopted by it, with some of the other reforms, such as requiring a good English education and better training by their preceptors, as recommended in former years, then the State boards of examiners would have no difficulty in deciding as to what a reputable dental college means. Another advantage that would be gained would be in lessening the number of colleges. Some of the worthless ones now in operation would be discontinued, and many of the same class prospectively in store for us in the future would never come into existence. Notwithstanding the fact that the sentiment of this Association, and of the best practitioners everywhere, has been that there are too many dental schools in proportion

to the number of pupils, and the fact that several have gone out of existence, we have to-day nineteen (counting an embryonic one in Chicago), which is more than double the number in operation ten years ago, showing an increase in the number of schools out of all proportion to the increase of students.

DISCUSSIONS.

Dr. ROBINSON: I can hardly agree with the paper just read, that we have not made any progress in the forty-six years since I began practice. I can see such marked progress in every department of science, that I sometimes feel myself hardly in place in having a seat in this body. If I were to recommend any two things as being of the utmost importance to the young practitioner, the first would be that he should be an honest man in his education, both to himself and to his patrons. The second would be, that he must be fully imbued with the dignity of his calling, and act as though he were conferring a greater favor on his patrons by giving them the benefit of his knowledge and skill, than they were conferring on him by giving him their patronage.

Dr. ATKINSON: It is in vain to attempt to elevate the standard of our profession so long as we follow the old lead. The idea of time having anything specifically to do with the granting of a diploma is of darkness and iniquity. I hold that any man who can prove that he is competent, should be so indorsed by those who have the power to give indorsement. One, two, three, or ten years has nothing to do with the acquirement of knowledge, only in a very insignificant sense. I am informed that there are schools that graduate on time whether students can answer the questions or not; and we have a school in New York, that upon a threat of a pupil whom they proposed to pluck gave him the diploma. Now the colleges want a little more pluck themselves, and they want to follow my old brother Jeremiah's method of doing things; learn to be honest themselves, and discriminate between applicants whether they are fit to study dentistry or not. That we have grown is evident, but have we grown to advantage? Is the fruit ripe, or only abundant and green? I take it that the latter is really true, and that the men among us who have the greatest ability are not the men who are regarded as literally well educated, but the men who had had instruction by reason of the honesty spoken of by

Dr. Robinson to comprehend what they were doing before they took hold of it, and then by religiously acquiring the knowledge before they offered their professional services to their fellow-men. It is this moral question that lies at the bottom—that we must inaugurate into our body as seekers for truth and as communicators of truth, if we wish to attain to a high standard of dental education.

Dr. PEIRCE: One word with reference to the remark made by Dr. Atkinson. He has struck the right key, but it does not harmonize with the present state of affairs. It is certainly a matter of indifference to the public where a professional man obtains his education. The work-bench or the college is equally acceptable, so that he possesses the requisite knowledge. But before this system of granting degrees, to which he has alluded, can be adopted, every State must have its board of examiners, and they must be beyond and above suspicion, competent in every department, and with the only authority to grant degrees or to license the professional man to pursue his calling; and for the government of this board there must be a fixed basis of qualification for the degree and an income independent of students. While our educational system is organized as to-day with the teacher dependent upon the student for his compensation and living, students must be required to spend a certain amount of time in the prosecution of their studies at college: for students to come before a board for the degree without reference to previous study, and that board depending upon the degrees conferred for a livelihood, would be a dangerous precedent to establish with the present status of humanity.

Dr. BARRETT: That is the prettiest theory in the world, the idea of basing a diploma upon a man's qualifications and not upon the time that he has spent in the schools, or the place where he shall have obtained his knowledge. You have a practical exemplification of what that theory will degenerate into in the State of Wisconsin. Delavan diploma-mills may easily be the consequence. When it is left to the teachers in the schools to determine what the qualifications are that entitle a man to a diploma, some check is absolutely necessary upon the grinding out of diplomas, otherwise it lets down the bars and opens the field for all manner of fraud. In the State of New York the medical profession have attempted to take from the medical schools the authority to grant diplomas, and to confer that power upon a board which shall be in some way connected with the Board of Regents of the State University. It has not been found practicable as yet, because the colleges themselves are not agreed

upon it. The medical profession, I believe, would vote for it to-morrow, and some colleges also, but others of them do not desire to have the granting of diplomas restricted in any way further than by some limitation of time of study. I hope this reform will soon be brought about, and then it may be proper and possible to grant a diploma upon actual knowledge, no matter whether the student has attended the schools for any particular time or not; until such a system is established every one here can see how easily frauds might be committed, and how many diploma-mills would probably be organized, if self-constituted teachers were sustained by the dental profession in issuing diplomas on their examination alone.

Dr. TAFT: The problems connected with the subject of education in our profession are many and difficult; they are not easy of solution. It is an easy matter to recount difficulties, but to devise the method of overcoming them is not so easy. It is true, that there is a diversity of procedure in different colleges, some pursuing one course and others another. If there is any power that can unify this work, can bring it upon a common level, it should be brought into exercise. It would be desirable to have the requirements for entrance into our colleges uniform. It would be well to have a common curriculum that should embrace the proper subjects for an accepted course. Let this be such as could be accepted by all as nearly as possible, then if any desired to extend the curriculum there could be no objection. With uniform requirements for admission, a uniform course of instruction, and uniform requirements for graduation, some of the evils at least that now attend our educational system would be greatly lessened, and perhaps removed altogether. How the concurrence of the various dental colleges could be secured for such a purpose, is not easy to determine. The time for it, if not already past, is now more favorable than it will be in the future; as colleges increase there will be a greater number, and perhaps greater variety of interests to harmonize. It may be that the power to accomplish this much desired end resides in the profession. But is the profession disposed to put forth any effort for the accomplishment of anything that shall improve our educational system? There was, some fifteen years ago, an association formed of the faculties of the various dental colleges in this country, and for a time it seemed to promise much for the future, but jealousies and antagonisms sprang up,—or rather existed from the first, and were permitted to grow till open rupture occurred,—and the withdrawal of two or three of the colleges resulted, while others became discouraged, and

the enterprise failed. But enough was done to demonstrate that by proper co-operation great good would have been accomplished, had the organization been maintained. Is not the time at hand when this can be done? Has not this body power and influence enough to aid and give encouragement to such an organization?

There has been for several years an association of the faculties of medical colleges, and great good has been accomplished by it. The American Medical Association encourages and fosters the association of college faculties. It has been suggested that the cause of dental education would be promoted by the examination of candidates for graduation by a board outside of and not connected with the colleges, and that the decision of such board should be final as to the fitness of the candidate. Experiments of this kind have been made in some instances, but never with any great degree of success. They have generally failed to learn the true standing of students, and in some instances have passed students who ought not to have passed, and occasionally have kept back those who were well qualified.

This body has from time to time passed resolutions bearing upon the subject of dental education. Such resolutions, though they have had some effect, have not remedied all the evils, but perhaps we should not be impatient; permanent institutions are of slow growth. I regard it as strictly within the province of this body to take cognizance of this subject, and act intelligently and wisely with the view of bringing about the best possible results. Without doubt one of the most important steps in this matter would be the organization and maintenance of an association of dental college faculties by which such regulations might be made as would result in some advance in the near future, and ultimately in great progress. For this at least let us work.

Dr. ALLPORT: I desire to correct the statement made in the report by Dr. Crouse, that there is a dental college in embryo in Chicago. I presume I am as well informed in regard to this matter as any one, and, so far as I am aware, there is no intention to start a dental college in Chicago.

While no one can appreciate more fully than I do the great benefits which we have derived from dental colleges, in my judgment, they have nearly served their purpose, and we now need something different and better—namely, a fuller and more complete medical education on the part of dentists than is now afforded in these colleges; and I may add that medical graduates need a better education than is now afforded in our medical colleges. Just what is to be

done in Chicago in regard to these matters is not yet fully determined; but, if anything, it will be in the way of supplying these two deficiencies.

As reference has been made to the movement contemplated in Chicago, I think it will be well to state just what has been done, as well as what is also proposed. On several occasions during the past few years, professors in two or three of our medical colleges have discussed the idea of establishing dental departments or colleges in connection with their respective schools, but believing that we have already dental colleges enough, the project has been opposed by nearly all of our best dentists. Less than a year ago, the idea was again revived by one of these leading schools, and I, with other dentists, was asked to join in the undertaking. Feeling, as I have just stated, that dentists need a better medical education, and that physicians need a better dental education than is now afforded in their respective schools, I suggested the advisability of establishing chairs on dental diseases in all of our medical colleges, irrespective of pathies, and of exacting of all their graduates the same degree of knowledge in regard to dental diseases and the science of their treatment, as is exacted in regard to any and all other diseases, and that all students, no matter whether they intend to engage in the general practice of medicine, or to pay their special attention to skin diseases, general surgery, or dental surgery, should matriculate as medical students, and when qualified, graduate as doctors of medicine.

It will be seen that the establishment of these chairs, so far as practical dentistry is concerned, means nothing; for quite as good, or even better dental instruction for the practice of dental surgery could be secured in any of our dental colleges; the object in this case being to impart to the general practitioner such knowledge in regard to dental diseases and what constitutes good dental treatment, as is not given in any of our medical colleges. In this way they will be better able to judge of the necessary qualifications of a good dentist than they now are, so that they may wisely select those whose medical education is such as to make them wise counselors as to dental complications, and their treatment. We all know that in the present state of dental knowledge on the part of physicians, they are quite as apt to call in consultation the worst tooth-carpenters we have, as they are to call our best-educated dentists. With them, a dentist means a man who can extract or fill teeth and put in artificial teeth, without regard to medical knowledge; and often our biggest dental

quacks are regarded quite as highly by the family physician as are those whom we would regard as qualified to diagnose and treat the various diseases directly or remotely connected with the teeth. In treating the eye or other organs of the body, the regular practitioner hesitates to consult with, or to recommend his patients to any but regular graduates of medicine who make the treatment of any particular class of disease a specialty; but in dental diseases, almost anybody will answer.

By so educating physicians that they will see the importance of a medical education in order to intelligently treat dental diseases, it is hoped that they will exact the same degree of medical knowledge on the part of the dental surgeon that they now exact on the part of the ophthalmologist. Could all of our medical colleges be induced to establish these chairs so that their future graduates would be properly educated, their influence would be so great in regard to this matter, that in a few years the dental surgeon would be forced to become a fully-educated medical man.

For manipulative training, and the application of medical science in the treatment of dental diseases, I suggested the establishing of a dental infirmary, which should be open to the students and graduates of all medical schools upon an equal footing, irrespective of pathies. In this infirmary I suggested that there should be such didactic teaching as would be essential to the medically-educated man in the treatment of dental diseases, together with such digital training as would make them skillful manipulators. By the establishment of dental chairs in our medical colleges, the dental and general education of their graduates would be so complete that but little more than manipulative dental training would be necessary in this infirmary in order to qualify young men to become intelligent and skillful dental surgeons. For this teaching I suggested the establishing of a corps of clinical teachers, selected from our very best practitioners, so that students could have the advantage of the best manipulative training possible, and upon the same footing as the medical graduate who purposes to enter upon the practice of any other department of medicine, (and who receives instruction in hospitals and infirmaries devoted to surgery, gynecology, and ophthalmology, from the most experienced and skilled in those departments). When these dental students had become qualified to enter upon the practice of dental surgery as a specialty in medicine, they should receive certificates of such qualification from the officers in charge of the infirmary. This proposition met with the approval of all

present. Although sanguine, myself, as to the advisability of this method of teaching, I presumed it would be opposed by the faculties of our medical colleges; judge then, of my surprise, when not a single teacher belonging to our seven medical colleges in Chicago opposed the idea, and six out of the seven colleges have already established either lectureships or professorships in regard to dental pathology and surgery, and I am assured that the seventh will do it as soon as the place can be properly filled. The dental infirmary is not yet organized, but it is hoped that it will be before the close of the coming sessions of our medical colleges. This is, in few words, about the status of the undertaking spoken of in the report.

Dr. BUCKINGHAM: If we could all agree upon what should be taught to students, we should have no difficulty, but while we have no such agreement, we must have these various modes of instruction. It does look to me to be the most sensible mode of teaching to teach a man what he is to practice. To teach him some branch as a mere ornament to his profession does not appear to me to be desirable. I admit there is a variation in our teaching. There will and must be while there are various colleges. If we were under a general government like that of England or Prussia, we could have a uniform system, and could demand that no man should practice a profession unless he had passed through one of the State institutions, but we have about one hundred and fifty medical colleges, all over the country. Every little town and village has a medical college of some kind or other. A college is like every other institution; it must live, and in order to live it must have students, and when you set the standard so high that the students will not come there, the professors will not work, for they cannot without some compensation. It is glory probably for the first year, but glory does not feed a man long, and without a paying patronage you will find your professors sliding out one after another until the institution gets into the hands of parties who will run it for their own interests. I could point you to two colleges particularly where this has occurred, one of which stood high. The charge that good men will take students merely to get their money is not true.

Dr. MORGAN: To propose to educate men and to graduate them on the ground of the time they shall have been engaged in study, is a snare and a delusion. I would ask gentlemen who are advancing that idea, if they have ever met any man that they thought would be too well qualified to practice dentistry after having taken the full course of lectures? Is the time going to hurt them? Is

there any injury done them? Are any of their rights trampled upon? None whatever. They have no right in college until they enter there, and when they enter they tacitly agree to abide by the laws of the college. There is no wrong to any one because they are entitled to remain two years or five years. The charge that men have graduated because they have attended two full courses, without regard to their qualifications is, I believe, a slander. Some men get through that are not thoroughly qualified, and they may want instruction in many things, but the guiding principle of men who are honest in their profession and who desire to do well by their students does not sanction such a course. With reference to an examining board outside of the institution, I think no man is so capable of examining a student as the man who has taught him. No man can ascertain so nearly his qualifications as the man who has been through the infirmary and the laboratory with him, who has lectured him time and again, and examined him from day to day upon subjects which he has been taught. I know men who, when they come before the faculty with whom they are well acquainted, are sometimes so abashed and embarrassed that it is impossible to get a respectable examination out of them. I examined a student not long ago who had taken his M.D., who had been through an excellent medical institution and he could scarcely answer half of a dozen questions in anatomy, such was his embarrassment. Are you going to increase that embarrassment and thereby do him an injustice by placing him before a board of examiners with whom he has no acquaintance, and who have no knowledge of his ability or capacity. You cannot bring in a board of examiners who can look at a man and tell what his capacity is; you must know him, you must have intercourse with him, you must understand his character and his mode of thought before you can judge of the extent of his qualifications, and I contend that, for that reason, it would be unjust and wrong, a stumbling-block to the profession, to adopt such a system of examination. We ought to have some standard of qualification established. There ought to be some unity of action between the different dental faculties in this country by which we could fix some standard. Some of the southern States have passed laws requiring every man to have a license before entering practice. Such laws have been passed in Alabama and Georgia; so that, if a man comes from Harvard University with his diploma, he has to go before the board to get his license, and if they see fit, they have a right to go behind his diploma and examine him, and to deny him the privilege of practicing dentistry, if they see he is

not qualified. It gives them an opportunity to discriminate between colleges which are honest in what they are doing and those which are not. I am glad of it. The scheme of having chairs in medical colleges for the purpose of teaching the institutes of dentistry is another delusion. It has never been adopted in a single case where it has not proved a curse. Take the experience of the gentlemen who have taught in the State of Iowa, where they had a chair in a medical college that was always filled by men of talent and high qualifications, and the experience of every one of the professors who has occupied that chair is such that they are opposed *in toto* to such an arrangement. They found that the poor medical students, those of little qualifications, when they went out into the country to practice, would send into the depôts and buy a little kit of tools and stick them in one end of their saddle-bags, and then they would go around pulling teeth here and stuffing teeth there with amalgam, and bringing disgrace upon the dental profession. I have had an opportunity to observe this thing in another school. If they are taught a little dentistry they go out to practice, and if they fail in practicing medicine they turn around and practice dentistry. I dread the day when our Chicago friends adopt any such system. It will prove a curse, and the oldest man among them will scarcely get out of the world before seeing the evil that has been brought upon the profession. I know where three or four students were required to pass a preliminary examination, and where they could not come up to the standard, they marched right out and went to a neighboring college and wrote their names upon a register and entered, and some of them graduated the first year without attending one full course. That sort of thing is going on in this country, and my impression is that the less association you have between the medical profession and the dental profession in teaching, the better it will be, except as a foundation to build a dental education on. Some gentlemen say they want a broad education. I have no objection. Make it as broad as you please, and the course as long as you please, but qualify men to practice dentistry in a dental college taught by dental men—men who understand what they are teaching, and what they are teaching it for. Tell me a man is qualified to teach an individual science that he has to apply in a certain direction, who knows nothing about the application that is to be made of it? He must know something of the application of the science which he is teaching for a special purpose, or the student who comes out and attempts to apply it for that purpose will fall very far short. It is so in the

very nature of the case. The motive which underlies this idea of connecting our dental and medical teachings, of qualifying men to go out from medical colleges with an M.D., for the purpose of practicing dentistry, is because they have a sort of notion that M.D. indicates a higher education, that it is a little more honorable, that it takes them into a higher class of associations. Is that true? I think not. I think the history of the medical profession in this country, with all its "isms" and heresies set up here and there, ought to be enough to deter any man who proposes to practice dentistry from going into it at all. He ought to go elsewhere to qualify himself. Would an M.D. be any evidence whatever? Take an M.D. of the present day—go down into your city—select the most prominent one there, a man who is known throughout the community as an M.D., and who is worthy of the degree; how much evidence is it to me that he is qualified to practice dentistry. Whenever you make that the *sine qua non*, that every man who goes into dentistry must be an M.D., without any title to show that he has studied dentistry, you open the door to every quack doctor in the land to march in with his kit of tools and proclaim himself a dentist, and there is no man to say whether he is or is not. You open the door and invite into the dental profession all that class who are failures in the practice of medicine, without any evidence of their qualifications, and without the knowledge that they have been to a place where they could qualify themselves to practice. I do not think the profession are ready for that sort of move, and I am confident that if they take it, it will work serious ill consequences to them.

Dr. BROPHY: We have heard for a number of years arguments similar to those which have been brought forward by Dr. Morgan, and we have also heard arguments which have caused us to feel that physicians should know something of the diseases of the teeth. I would like to ask the gentleman if he can expect the eminent medical man whom he has mentioned as living in this city to know all about dental diseases. Certainly he cannot. He had no opportunity to learn anything in regard to dental pathology and dental surgery. Is that an argument against us? Most assuredly not. Those who enter upon the general practice of medicine, if they are as familiar with the diseases of the teeth as they are with the diseases of the eye and ear, will be more intelligently prepared to diagnose those cases and send them to men of intelligence who can properly treat them. In the city of Chicago I met a young man, only last week, who had received a thorough medical education in

one of the schools from which he graduated. He had graduated from the literary department of Yale College, from Rush Medical College, from Bellevue Hospital Medical College, had been a student three years in Vienna; and that man did not know the difference between an educated and intelligent dentist and the most consummate quack in our city to whom he was sending some of his best patients. Why? Because there was in the college in which he had received his education the lack of teaching which he should have had. Would Dr. Morgan charge the physician who has not had the opportunity of studying diseases of the eye and ear with ignorance, because he has not had such opportunities, or would he lay the fault to the institution which has not furnished him with the opportunities? In most of the States they have laws which require that men shall be educated in certain manipulative parts of dentistry, they shall be able to do certain operations, and they put them to a thorough test. I know our board do. Now, sir, it is impossible with the course that is marked out in Chicago for any of these young physicians to go forth and enter upon the practice of dentistry or the filling of a tooth with the few instruments that they have in one end of their saddle-bags, because the State law will not permit it. They may go on and practice medicine, but they cannot enter upon the practice of dental operations or the manipulations of dentistry. This absolutely and completely precludes any quackery from the medical men who have been trained in dental manipulation or in dental surgery. Dentistry is not confined to the simple filling of a tooth and the construction of artificial teeth. It embraces for its field of operation a portion of surgery and pathology and all the familiar principles of medicine, and where can these principles be best taught? Can they not be best taught in medical schools by teachers who have spent the best portion of their lives in informing themselves so that they can understand the principles and demonstrate them? Most assuredly. It is not the intention of this movement in Chicago to establish a dental college. It is designed to place dentistry in precisely the same position that is occupied by ophthalmology and other medical specialties. Students receive their education in medical colleges. They have obtained their degree of M.D., provided they are qualified, and after this, if they can pass a satisfactory examination before the board of examiners of the infirmary which is expected to be established, then they are qualified to enter upon the practice of dentistry, but not until then. Furthermore, if they were to commence, our State board would be after them, and they would

find themselves in trouble. I do not like to hear gentlemen argue and speak so disparagingly of the profession from which we arose. I think it is an argument in the wrong direction. I honor and respect too much the eminent medical men from whom most of our medical knowledge has been derived; who, indeed, are the authors of all our dental text-books with one or two exceptions. These are the sentiments which I wish to offer. We want the men who practice medicine to know something about the teeth. It is with them that the care of the teeth of the American citizen rests. They can accomplish more in the prevention of decay of the teeth than all the dentists in America to-day.

Dr. KULP: As Dr. Morgan alluded to our experiment in Iowa, I wish to explain. Twelve or thirteen years ago, when the medical department of the State University was established, the medical faculty invited us to a place in their school—to a chair on dental science. Dr. Wilson, who is present, and myself, were invited to deliver the lectures. We delivered four lectures each during the session for two years; we failed in accomplishing all that we hoped for in the start, but we, perhaps, did a little more than we intended to, for after a few years we found many of the young M.D.'s who graduated in those two sessions were practicing dentistry all over the State in the country towns. I would at times receive letters from young men asking my advice on some particular subject. I would give them advice, thinking it was some case in which it would be necessary for them to do something for the relief of their patients, but I very soon discovered that these men were practicing dentistry, and in the meantime we had circulars flying all over the State, informing us that the Iowa Dental Manufacturing Company was established, with headquarters in Des Moines,—and they were scattered in every community; we learned that these young M.D.'s were extracting the teeth, while they had their "dental men" taking the impressions and sending the models down to headquarters, who would in time return the plates and they were fitted in by the M.D.'s. We protested very strongly to the medical faculty. We told them we would have nothing further to do with their institution unless they stopped that sort of procedure They instituted some pretty strenuous measures, and did stop it to some extent. There are a few who are still at it but we have cut them off now in our State law. What I want to emphasize is that our experience with the plan, that started out on the very same principle that these good men from Chicago are starting out with, has been very much

against the method. My observation of twelve or fourteen years with that sort of work is, that it will bring a curse upon the dental profession. That is my prophecy, and if it does not prove true you can put me down as no prophet.

Dr. ALLPORT: Dr. Morgan seems to have a very great aversion to prospective practitioners of dentistry having anything to do with medical colleges or medical teachers; now I would like to ask the gentleman one square, honest question: did he not when he decided to educate his own son as a dentist put him into a medical college and graduate him as an M D. previous to his instruction in a dental college? and does he not advise all young men to follow the same course if they desire to take a front rank as practitioners of dental surgery?

Dr. MORGAN: I think a medical education is a first-rate foundation upon which to build a dental education, and I have no objection to it in that form, but a man should have a dental education aside from the medical.

Dr. ALLPORT: One thing more. Our friend Dr. Kulp seems much afraid that medical graduates who know anything about diseases of the teeth, will be tinkering at dentistry around the country, and become dental quacks. Did the doctor ever know bigger quacks than come from some of our dental colleges? We have not in Chicago to-day greater quacks than some of our dental graduates; but this is no argument against dental colleges. You cannot make respectable people of everybody, either with or without an education. It is the individual and not education that makes the quack. The question whether a medical education is essential or not to the intelligent practice of dentistry, is determined by the question, whether dentistry is an independent profession or a specialty in medicine. If the latter, it should take the same course that other specialties do. First lay the foundations broad and deep in the science of medicine, and then build our specialty upon it, the same as the specialties in law are built upon the great and fundamental principles of justice as laid down in the comprehensive teachings of such jurists and pleaders as Blackstone, Coke, and Chitty. The idea of undertaking to build up an independent profession (as some claim that dentistry is) out of a segment of a profession, is nonsense; we have been at it long enough; let us go to work and lay our foundations deep and broad in the science of medicine, and then we shall have something upon which to build an intelligent practice. If the science of medicine forms a basis upon which all diseases are treated, it would be as consistent to undertake to build up a distinct

profession in the practice of criminal law, or admiralty or commercial law, without a knowledge of the principles of general law, as to undertake to build up a separate profession out of the treatment of any particular class of diseases, when a general knowledge of medicine is essential at every step in the treatment. A knowledge of anatomy and pathology is requisite in the treatment of all classes of disease, and this knowledge must be acquired from medical textbooks, which discuss the principles underlying the general practice of medicine; and it is from these books that we get all the knowledge we have of general principles. It is upon these principles that all medical teachings in our dental colleges are based, as well as all books that relate to our special practice. And to pretend that dental surgery is an independent profession when not an intelligent step can be taken in its practice without medical knowledge is simply absurd. Without this medical knowledge it is not a profession—it is a trade; and it is a specialty in medicine just in proportion as the practitioner is medically educated. When dental education is established upon these principles we shall have genuine dental surgeons, but until then we shall not.

Dr. E. HUNTER: If it is a fact, as gentlemen say, that the greatest quacks that are in the dental profession (and it will not be denied) are graduates of colleges, it seems to me very evident that some other than an educational standard should be adopted for admitting candidates into our offices as well as colleges. Adaptability for any employment or profession, it seems to me, should be the requirement for entering upon a life-work. Time is too precious to be thrown away on any special employment where nature has refused a special liberal endowment in that direction. To encourage a young person to enter the dental profession without good natural abilities for that, including sterling integrity, is to blight his life-work, when in some proper sphere he could be a blessing to himself and humanity. There should be no guess-work about so important a matter as that. Let no young man be encouraged to make an attempt that will only end in his being denounced as charlatan, empiric, and quack. A man must be born a dentist to ever become proficient as such. The capacity for becoming a dentist, physician, mathematician, or orator, can never be bought with money or attained by a college course of any number of years. If parents have been illiberal in laying a foundation for special education, it is, to say the least, a mistake to enter upon that for a life-work. If parents have endowed a child with genius, he may rise from obscurity and poverty to the highest

eminence without the benefits of a college course. Of course, education can do its best work for such an individual. Favorable parentage makes one master of circumstances. Though he dine upon a baker's roll while walking the streets, or splits the rails to fence his father's or neighbor's corn, he may grace kingly courts or rule a nation, and with his magic pen transform millions of slaves into freemen, though a college might never have been honored by his presence. Open the professional doors to none who have not the capacity for the specialty, and the problem of dental education will be easily and speedily solved.

Dr. BUCKINGHAM: It appears remarkably strange to me that the dentists are not competent to teach dentistry—that all these men who are talking here do not know enough of physiology, anatomy, and medicine, to teach dentistry.

Dr. MORGAN: With regard to the breadth of education. What is the reason you cannot educate a man well and thoroughly in a dental college? Why cannot you provide for teaching anatomy, physiology and chemistry? In the institution with which I am connected these branches are provided for. Why do you want to run after medical men who are directing their teaching in another line? Why not teach it in your own particular line? It was said here that I had said something disrespectful of the medical profession. I did not do any such thing. I said that the most distinguished medical man in this city was not able to practice dentistry, and he will tell you exactly the same thing, and he would not consider it disrespectful if I should say to him, you do not know how to teach it. But there are gentlemen here who do speak disrespectfully of the profession, in saying they do not know enough to teach the students who go into their institution what they ought to know, that they ought to teach them everything about dental diseases but cannot. You are the gentlemen who are disparaging the medical profession, while I hold them up as honorable men, especially those who are doctors of medicine in truth.

Dr. ROBINSON: I want to say, that while I fully agree with Dr. Allport, that a medical man should be a good dentist,—and I have had large experience,—I never have known one man who was a doctor of medicine and a dentist to be the very best without he was a dentist first before he was a doctor of medicine.

VOLUNTARY PAPER.

VOLUNTARY PAPER BY JOSEPH RICHARDSON, OF TERRE HAUTE, IND.

Reflex Lesions of the Oral Cavity Associated with Pregnancy.

AT a late meeting of the Indiana State Dental Association, it was my privilege to read before that body a paper entitled "Correlated Diseases of the Teeth and Ear." The purpose of the paper was to present some ascertained facts in regard to the reflex nervous relationship between the teeth and the various structures of the auditory apparatus, and to account for the manner in which not only functional but nutritive or trophic diseases of the latter occurred, as a sequence of irritation having its source primarily in the teeth or gums.

Researches directed to the ascertainment of sympathetic relationships of other organs, as the eye, brain, stomach, uterus, etc., would probably reveal them also as so many areas correlated in like manner as the ear to primary disorders of the organs of the mouth.

It is not my present purpose, however, to consider further the reflex diseases of organs or regions remote from the mouth, but to reverse the order of inquiry, and trace, if possible, the sympathetic dependency of certain disorders of the teeth upon functional disturbances or structural lesions primarily located in some remote part of the general organism; premising that a better understanding of the laws of reflex action, a more familiar and exact acquaintance with nerve-function, and a clearer insight into the correlated areas existing between widely-separated regions, would lead to more rational and trustworthy views of the etiology of many sympathetic disorders of the buccal cavity, the origin and nature of which are to us as yet measurably a sealed book.

In the discussion of my subject I shall, in order to confine myself within reasonable limits, consider only certain abnormal or pathological states of the oral cavity very frequently associated with pregnancy.

The thought may occur to some that, as utero-gestation is essentially a physiological act, it could not give rise to such irritation as

would establish sympathetic affections of the teeth; and this would doubtless be true if the uterine functions were always normally performed. But the simple fact that the reproductive act is, ordinarily, a *conscious* one, leads obviously to the conclusion of functional derangement, for the senses take no cognizance of the normal processes of organic life, and hence no one in perfect health is supposed to have, through the medium of common sensation, any mental perception of a brain, stomach, heart, liver, or uterus. The frequency of oral disorders coincident with pregnancy is, in itself, presumptive evidence of generally perturbed uterine function more or less severe and persistent.

Before proceeding to point out the nervous relationship between the uterus and the oral cavity, it would seem pertinent to examine briefly the generally-accepted theory in explanation of certain pathological states of the organs of the mouth associated with gestation. The prevailing view, I believe, is that the more rapid decay of the teeth characterizing this period is due to the increased consumption of lime-salts incident to fœtal growth and development, and that this superadded draft upon the calcific elements of the maternal circulation, by diverting the lime-salts from the teeth, impairs the organic integrity of the latter, producing a nutritive lesion characterized by diminished ossific deposits and a corresponding domination of the animal constituents—in other words *softening*, a condition rightly supposed to favor accelerated decay. This theory would seem to be predicated on the assumption that the bone-producing elements supplied by the ingesta are, in the unimpregnated state, largely if not wholly appropriated by the tissues into which they enter as a component,—that there is not, ordinarily, any adequate provision in the way of excess for the demands of a process of Divine ordination, and that when the exigency occurs, it becomes, as between the mother's teeth and the fœtus, a simple question of *divide*.

Now, aside from comparatively infrequent cases of tissue-starvation consequent on pronounced deficiency of the bone-producing elements in the food, it would seem but rational to suppose that there is, ordinarily, a *surplus* of the lime-salts in the circulation, adequate for all the contingent needs of both mother and child. If this were not so,—if in the unimpregnated state there were but a simple sufficiency of the lime-salts for the ordinary purposes of growth and repair, in pregnancy, the fœtal processes of ossification would suffer in common with the mother's teeth whenever the

demand for a largely increased supply occurred. As a necessary result of such imperfect provision of calcific matter during the period of fœtal evolution, we should expect to find, in after life, osteological malformations a characteristic inheritance of the human race,—an infirmity by no means common. If this theory of diversion, or robbing Peter to pay Paul, predicated on the assumption of insufficient supply for mother and child is, as I believe it to be, neither rational nor physiological, nor in accordance with any just interpretation of the laws of nutrition, far less is it acceptable as an explanation of other oral phenomena associated with gestation. While it might account for increased sensitiveness of tooth-bone to mechanical or chemical stimuli where decay exists, it is hardly competent to explain the distressing and oftentimes violent pains located in teeth but slightly decayed, or even of unbroken structure, and which are clearly distinguishable from mere hyper-sensitiveness; nor does it in any manner explain the presence of those various neuralgic affections of neighboring parts coincident with impregnation.

We must look further, then, I think, for some more rational solution of the problem of causation as it relates to the oral phenomena coincident with the reproductive processes. A more plausible and defensible theory, I believe, would assign to these phenomena the character of reflex lesions, structural or functional. To justify this conclusion, I shall first endeavor to ascertain if the organs of the mouth constitute an area correlated to the uterus through the medium of the sympathetic system of nerves, and then consider in what manner the vaso-motor fibres of that system operate as factors in the production of the oral phenomena which I have characterized as reflex lesions. It is important to remember in this connection the essential facts now broadly recognized by modern physiologists, namely, that, with few exceptions, all sensori-motor nerves comprise fibres belonging to the vaso-motor system; that the latter are largely distributed to the blood-vessels; and that their peculiar and distinctive office is to control and regulate the calibre of the vessels to which they are distributed, and consequently the blood-supply to any given part. First, then, do the teeth constitute an area correlated to the uterus through the medium of the sympathetic system of nerves? Such a relationship, I think, is sufficiently obvious, and may be traced as follows: The blood-supply to the teeth is derived from the external carotid artery through its branches, the inferior dental and alveolar branch of the internal maxillary arteries, and the vaso-motor nerves controlling the calibre of these vessels are derived from the

external carotid plexus of the sympathetic,—a plexus derived immediately from the superior cervical ganglion. The uterus, its appendages, and the vaginal walls, are supplied with nerves from the pelvic plexus of the sympathetic, which brings these several parts into immediate relation to the spinal sympathetic system. Thus it will be seen that any tissue-impression having its origin in the uterus or associated structures, would be transmitted by way of the afferent vaso-motor fibres to the vaso-motor centre in the medulla, and returning by the efferent fibres in reflex relationship with the former, would reach the carotid sympathetic plexus through the superior cervical ganglion. As the branches of the external carotid artery, to which this plexus is distributed, supply the teeth with blood-vessels, it is not difficult, I think, to see how the teeth of the superior and inferior maxillæ become an area correlated to the uterus through the medium of the carotid plexus of the sympathetic system.

Assuming the correctness of this view of the relationship of the regions under consideration, it only remains to ascertain how, through the action of the vaso-motor nerves, nutritive lesions or reflex functional disturbances in connection with the teeth may occur as a sequence of irritation having its source in the gravid uterus, its appendages, or the vaginal walls.

Dr. Charles H. Burnett, in a treatise on the Ear, says: "It may be stated in a general way that *the effect of any irritation in a vaso-motor nerve-tract may be to excite vessel-dilatation through diminished inhibitory nerve-power, in a correlated area.*" Accepting this statement as an ascertained physiological fact, we should have, as the result of any irritation having its source in the uterus or its associated parts, impaired tonicity of the pulp-vessels, manifesting itself in *dilatation* and consequent congestion or hyperæmia. If the disturbance in the pelvic region were such as to produce only slight irritation, the reflex lesion of the pulp would manifest itself as a so-called sympathetic neuralgia consequent on pressure of nerve-fibrils by engorgement and distension of the blood-vessels. These sympathetic neuralgias of the teeth, of either sound or unsound structure, are very commonly associated with pregnancy, and cannot be rationally accounted for, I apprehend, except in the manner here indicated. Ordinarily, the exciting cause would probably be insufficient to induce more than mere functional disturbance in the pulp, but it is easy to see how reflex irritations of sufficient intensity and perseverance might induce blood-stasis, inflammation, and disorganization or death of the pulp.

Now, let us apply the facts and conclusions of this paper in explanation of the phenomena of *softening* and the more rapid decay of the teeth during the period of gestation. The lesion is clearly a reflex one. Anything like habitual hyperæmia of the vessels of the pulp must, by altering or diminishing the blood-supply, more or less seriously interfere with the nutritive processes concerned in the reparation of wasting tissues. The consequence of such modification or interference with the normal functions of the pulp, so far as its vessels are concerned in the nutrition of the teeth, would be in the direction of degeneracy or retrograde metamorphosis of tooth-structure. This would imply, we may suppose, defective assimilation of ossific matter for purposes of repair, and certainly diminished vital resistance to the action of agents operative in producing solution of the lime-salts.

We should have, consequently, from the operation of these causes, a tendency to general softening, hyper-sensitiveness, and greatly increased rapidity of decay. These are frequent complications coincident with pregnancy, are always more or less distressing and harmful, and often involve the loss of valuable organs. The subject is therefore one of great interest to us as oral specialists.

By request of the author, the following, as having some pertinent relation to the subject-matter discussed in the foregoing paper, is appended:

"*Storage and Utilization of Phosphates in Pregnancy.*—In a recent number of the *Union Medicale*, Dr. Delattre discusses a phenomenon of early pregnancy which he considers has not hitherto received the attention which, both on physiological and therapeutical grounds, it deserves. He refers to the almost complete disappearance of the phosphates from the urine. These salts, he says, are, except the small proportion as yet required by the development of the fœtus, either stored up in the maternal bones, which increase in weight and density, or, occasionally, deposited on their surface in the form of osteophytes, which have long been looked upon as errors of nutrition. In the later months, when the fœtal bones are growing and ossifying rapidly, these reserves are drawn on, and the osteophytes, if present, disappear. The absorption is not complete at the time when the child is born, but goes on during the normal time of lactation, supplying phosphates to the milk. Such is the course of events in the case of a healthy and well-nourished woman."

STANDING RESOLUTIONS.

The following standing resolutions are in force at this time, August 1, 1882.

Resolved, That henceforth no person shall be received as a delegate who is in arrears for dues, or until he has paid to the Treasurer the full amount due at the time his name was dropped for non-payment.

Adopted August, 1874.

Resolved, That hereafter no dental college shall be entitled to representation in this Association that does not require a good English education as a preliminary qualification for its matriculants, to be ascertained by examination.

Adopted August, 1879.

Resolved, That in order to secure representation in this Association, dental colleges must, subsequent to October, 1881, require all students entering therein to take two full courses of lectures previous to coming forward for examination and graduation, and must also state these conditions in their next annual announcement.

Adopted August, 1880.

Resolved, That hereafter no society shall be entitled to representation in this Association that does not require it members to live up to the requirements of our Code of Ethics.

Resolved, When it comes to the knowledge of the Committee on Credentials that any applicant for membership is violating our Code, said applicant shall not be received, and all such applicants shall be referred by the committee to the societies whose delegates they are, and in no case shall this Association be compelled to treat with violations of the Code, except where the violator is a member of this body and has no membership in any local society.

Adopted 1881.

Resolved, That the Secretary be instructed to assign members who may neglect to make their own choice the Section in which they are expected to work.

Adopted 1879.

Resolved, That the reports of Sections shall be called by the President in consecutive order, beginning each succeeding year one number higher than on the preceding year.

1879	commencing	with	No. I.
1880	"	"	No. II.
1881	"	"	No. III.
1882	"	"	No. IV.
1883	"	"	No. V.
1884	"	"	No. VI.
1885	"	"	No. VII.
1886	"	"	No. I.

Adopted 1879.

Resolved, That from and after this date, the Treasurer of this Association shall be required to give such bonds for the faithful discharge of the duties devolving upon his office, as the second division of the Executive Committee may deem necessary, and his predecessor shall not surrender the funds, books, or papers, until he is informed by said Executive Committee that such bonds have been executed.

This was adopted 1882.

TRANSACTIONS

OF THE

AMERICAN DENTAL ASSOCIATION

AT THE

TWENTY-THIRD ANNUAL SESSION,

HELD AT NIAGARA FALLS,

COMMENCING ON THE 7TH OF AUGUST, 1883.

PUBLICATION COMMITTEE:

GEO. H. CUSHING, A. W. HARLAN, S. G. PERRY.

PHILADELPHIA:
THE S. S. WHITE DENTAL MANUFACTURING CO.
1884.

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DISCLAIMER.

THE AMERICAN DENTAL ASSOCIATION, although formally accepting and publishing the reports of the various Standing Committees and the essays read before the Association, holds itself wholly irresponsible for the opinions, theories, or criticisms therein contained, except when otherwise decided by special resolution.—*Constitution.*

PRESS OF PATTERSON & WHITE,
PHILADELPHIA.

LIST OF OFFICERS FROM DATE OF ORGANIZATION.

PRELIMINARY CONVENTION, NIAGARA FALLS, AUGUST, 1859.

President,	W. W. ALLPORT . . .	Chicago.
Secretary,	J. TAFT	Cincinnati.

ORGANIZATION AND FIRST SESSION OF ASSOCIATION, WASHINGTON, D. C., JULY, 1860.

[Annual meetings to be hereafter last Tuesday in July.]

President,	W. H. ATKINSON . . .	Cleveland.
1st Vice-President,	J. B. GIBBS	Washington, D. C.
2d Vice-President,	W. CAHOON	Detroit, Mich.
Recording Secretary,	J. TAFT	Cincinnati.
Corresponding Secretary,	W. MUIR ROGERS . . .	Shelbyville, Ky.
Treasurer,	S. DILLINGHAM . . .	Philadelphia.

[NO MEETING IN 1861.]

CLEVELAND, JULY, 1862.

President,	GEO. WATT	Xenia, Ohio.
1st Vice-President,	W. H. ALLEN . . .	New York City.
2d Vice-President,	W. D. STONE . . .	Lexington, Ky.
Recording Secretary,	J. TAFT	Cincinnati.
Corresponding Secretary,	J. F. JOHNSTON . . .	Indianapolis.
Treasurer,	W. A. PEASE . . .	Dayton, Ohio.

PHILADELPHIA, JULY, 1863.

President,	W. H. ALLEN . . .	New York City.
1st Vice-President,	J. H. MCQUILLEN . .	Philadelphia.
2d Vice-President,	WM. B. HURD . . .	Brooklyn, N. Y.
Recording Secretary,	J. TAFT	Cincinnati.
Corresponding Secretary,	C. R. BUTLER . . .	Cleveland.
Treasurer,	A. C. HAWES . . .	New York City.

NIAGARA FALLS, JULY, 1864.

President,	J. H. MCQUILLEN . .	Philadelphia.
1st Vice-President,	C. P. FITCH	New York City.
2d Vice-President,	H. BENEDICT	Detroit.
Recording Secretary,	J. TAFT	Cincinnati.
Corresponding Secretary,	GEO. W. ELLIS . . .	Philadelphia.
Treasurer,	I. J. WETHERBEE . . .	Boston.

CHICAGO, JULY, 1865.

President,	C. W. SPALDING . . .	St. Louis.
1st Vice-President,	GEO. H. CUSHING . . .	Chicago.
2d Vice-President,	JAS. MCMANUS . . .	Hartford.
Recording Secretary,	J. TAFT	Cincinnati.
Corresponding Secretary,	L. D. SHEPARD . . .	Boston.
Treasurer,	I. J. WETHERBEE . . .	Boston.

BOSTON, JULY, 1866.

President,	C. P. FITCH	New York City.
1st Vice-President,	W. H. MORGAN . . .	Nashville.
2d Vice-President,	L. D. SHEPARD . . .	Boston.
Recording Secretary,	J. TAFT	Cincinnati.
Corresponding Secretary,	A. HILL	Norwalk, Conn.
Treasurer,	W. W. SHEFFIELD . .	New London, Conn.

CINCINNATI, JULY, 1867.

President,	A. LAWRENCE . . .	Lowell, Mass.
1st Vice-President,	P. G. C. HUNT . . .	Indianapolis, Ind.
2d Vice-President,	A. S. TALBERT . . .	Lexington, Ky.
Recording Secretary,	J. TAFT	Cincinnati.
Corresponding Secretary,	C. R. BUTLER . . .	Cleveland.
Treasurer,	W. H. GODDARD . . .	Louisville, Ky.

NIAGARA FALLS, JULY, 1868.

President,	JONATHAN TAFT . . .	Cincinnati.
1st Vice-President,	HOMER JUDD	St. Louis.
2d Vice-President,	A. A. BLOUNT . . .	Springfield, Ohio.
Recording Secretary,	EDGAR PARK	St. Louis.
Corresponding Secretary,	JAS. MCMANUS . . .	Hartford.
Treasurer,	W. H. GODDARD . . .	Louisville.

SARATOGA SPRINGS, AUGUST, 1869.*

President,	HOMER JUDD	St. Louis.
1st Vice-President,	S. J. COBB	Nashville.
2d Vice-President,	C. E. FRANCIS . . .	New York City.
Recording Secretary,	M. S. DEAN	Chicago.
Corresponding Secretary,	I. A. SALMON . . .	Boston.
Treasurer,	W. H. GODDARD . . .	Louisville.

* Owing to a change in the Constitution, officers elected at this and the sessions following served at the next annual meeting subsequent to their election, and the sessions of and after 1869 commenced on the first Tuesday in August.

NASHVILLE, AUGUST, 1870.

President,	W. H. MORGAN . . .	Nashville.
1st Vice-President,	S. W. DENNIS . . .	San Francisco.
2d Vice-President,	J. R. WALKER . . .	New Orleans.
Recording Secretary,	M. S. DEAN	Chicago.
Corresponding Secretary,	I. A. SALMON	Boston.
Treasurer,	W. H. GODDARD . . .	Louisville.

WHITE SULPHUR SPRINGS, VA., AUGUST, 1871.

President,	GEO. H. CUSHING . . .	Chicago.
1st Vice-President,	C. E. FRANCIS . . .	New York City.
2d Vice-President,	J. R. WALKER . . .	New Orleans.
Recording Secretary,	M. S. DEAN	Chicago.
Corresponding Secretary,	I. A. SALMON . . .	Boston.
Treasurer,	W. H. GODDARD . . .	Louisville.

NIAGARA FALLS, AUGUST, 1872.

President,	P. G. C. HUNT . . .	Indianapolis.
1st Vice-President,	L. D. SHEPARD . . .	Boston.
2d Vice-President,	G. A. MILLS	Brooklyn, N. Y.
Recording Secretary,	M. S. DEAN	Chicago.
Corresponding Secretary,	J. TAFT	Cincinnati.
Treasurer,	W. H. GODDARD . . .	Louisville.

PUT-IN-BAY, AUGUST, 1873.

President,	T. L. BUCKINGHAM . .	Philadelphia.
1st Vice-President,	ISAIAH FORBES . . .	St. Louis.
2d Vice-President,	A. F. MCLAIN . . .	New Orleans.
Recording Secretary,	M. S. DEAN	Chicago.
Corresponding Secretary,	J. TAFT	Cincinnati.
Treasurer,	W. H. GODDARD . . .	Louisville.

DETROIT, AUGUST, 1874.

President,	M. S. DEAN	Chicago.
1st Vice-President,	GEO. W. KEELY . . .	Oxford, Ohio.
2d Vice-President,	J. S. KNAPP	New Orleans.
Recording Secretary,	C. STODDARD SMITH . .	Springfield, Ill.
Corresponding Secretary,	GEO. L. FIELD . . .	Detroit.
Treasurer,	W. H. GODDARD . . .	Louisville.

NIAGARA FALLS, AUGUST, 1875.

President,	A. L. NORTHROP . . .	New York City.
1st Vice-President,	H. J. MCKELLOPS . .	St. Louis.
2d Vice-President,	H. A. SMITH . . .	Cincinnati.
Recording Secretary,	C. STODDARD SMITH . .	Springfield, Ill.
Corresponding Secretary,	J. H. MCQUILLEN . .	Philadelphia.
Treasurer,	W. H. GODDARD . . .	Louisville.

PHILADELPHIA, AUGUST, 1876.

President,	GEO. W. KEELY . . .	Oxford, Ohio.
1st Vice-President,	C. N. PEIRCE . . .	Philadelphia.
2d Vice-President,	CORYDON PALMER . . .	New York City.
Recording Secretary,	C. STODDARD SMITH . .	Springfield, Ill.
Corresponding Secretary,	J. H. MCQUILLEN . .	Philadelphia.
Treasurer,	W. H. GODDARD . . .	Louisville.

CHICAGO, AUGUST, 1877.

President,	F. H. REHWINKEL . .	Chillicothe, Ohio.
1st Vice-President,	L. D. SHEPARD . . .	Boston.
2d Vice-President,	GEO. T. BARKER . . .	Philadelphia.
Recording Secretary,	M. S. DEAN	Chicago.
Corresponding Secretary,	M. H. WEBB . . .	Lancaster, Pa.
Treasurer,	W. H. GODDARD . . .	Louisville.

NIAGARA FALLS, AUGUST, 1878.

President,	H. J. MCKELLOPS . .	St. Louis.
1st Vice-President,	L. D. SHEPARD . . .	Boston.
2d Vice-President,	L. D. CARPENTER . . .	Atlanta, Ga.
Recording Secretary,	GEO. H. CUSHING . . .	Chicago.
Corresponding Secretary,	A. O. RAWLS . . .	Lexington, Ky.
Treasurer,	W. H. GODDARD . . .	Louisville.

NIAGARA FALLS, AUGUST, 1879.

President,	L. D. SHEPARD . . .	Boston.
1st Vice-President,	C. N. PEIRCE . . .	Philadelphia.
2d Vice-President,	GEO. L. FIELD . . .	Detroit.
Recording Secretary,	GEO. H. CUSHING . . .	Chicago.
Corresponding Secretary,	M. H. WEBB . . .	Lancaster, Pa.
Treasurer,	W. H. GODDARD . . .	Louisville.

BOSTON, AUGUST, 1880.

President,	C. N. PEIRCE . . .	Philadelphia.
1st Vice-President,	W. C. BARRETT . . .	Buffalo.
2d Vice-President,	GEO. J. FRIEDRICHS . .	New Orleans.
Recording Secretary,	GEO. H. CUSHING . . .	Chicago.
Corresponding Secretary,	A. M. DUDLEY . . .	Salem, Mass.
Treasurer,	W. H. GODDARD . . .	Louisville.

NEW YORK, JULY, 1881.

President,	H. A. SMITH	Cincinnati.
1st Vice-President,	W. C. BARRETT . . .	Buffalo.
2d Vice-President,	GEO. J. FRIEDRICHS . .	New Orleans.
Recording Secretary,	GEO. H. CUSHING . . .	Chicago.
Corresponding Secretary,	A. M. DUDLEY . . .	Salem, Mass.
Treasurer,	W. H. GODDARD . . .	Louisville.

CINCINNATI, AUGUST, 1882.

President,	W. H. GODDARD . . .	Louisville, Ky.
1st Vice-President,	GEO. J. FRIEDRICHS . .	New Orleans.
2d Vice-President,	E. T. DARBY . . .	Philadelphia.
Recording Secretary,	GEO. H. CUSHING . . .	Chicago.
Corresponding Secretary,	A. W. HARLAN . . .	Chicago.
Treasurer,	GEO. W. KEELY . . .	Oxford, Ohio.

NIAGARA FALLS, AUGUST, 1883.

President,	E. T. DARBY	Philadelphia.
1st Vice-President,	C. S. STOCKTON . . .	Newark, N. J.
2d Vice-President,	T. T. MOORE	Columbia, S. C.
Recording Secretary,	GEO. H. CUSHING . . .	Chicago.
Corresponding Secretary,	A. W. HARLAN . . .	Chicago.
Treasurer,	GEO. W. KEELY . . .	Oxford, Ohio.

EXECUTIVE COMMITTEE FOR SESSION OF 1884.

J. N. CROUSE, Chairman. A. M. DUDLEY, Secretary.

FIRST DIVISION—COMMITTEE OF ARRANGEMENTS.

*ODELL, FIELD, AND FRIEDRICHS.

SECOND DIVISION—ON CREDENTIALS, ETHICS, AND AUDITING ACCOUNTS.

CROUSE, DUDLEY, AND PERRY.

THIRD DIVISION—ON VOLUNTEER ESSAYS.

*PEIRCE, *REHWINKEL, AND MORRISON.

LOCAL COMMITTEE OF ARRANGEMENTS.

M. L. RHEIN, F. M. ODELL, AND C. F. RICH.

*These go out August, 1884.

CONTENTS.

	PAGE
Disclaimer	2
Officers from date of organization	3–7
Roll-call	13–16
Amendment to Constitution adopted	16
Amendment offered by Dr. Allport indefinitely postponed	16
Executive Committee's report adopted fixing hours for meetings	16
Committee on Credentials' report	17
Publication Committee's report	17
Motion to appoint Committee on death of Dr. Webb	18
Motion to appoint Committee on death of Dr. Goddard	18
Motion to appoint Committee on death of Dr. Allen	18
Motion of thanks to The S. S. White Dental Manufacturing Co.	18
Fixing time and place of meeting of Sections	18
Committee's report on memorial to Dr. Webb	19
Section V. called	19
Section VI. called	19
Section VI. passed	19
Section V. again called	19
Motion to make Dr. Bödecker's paper special order for evening session	19
Section VII. called	19
Section VII. passed	19
Section I. called	19
Mr. Richardson, of London, introduced	19
Motion to suspend regular order	20
Motion to request dealers to close their doors	20
Motion to call Sections in regular numerical order	20
Prize Essay Committee's report	20
Dr. Bödecker's paper discussed	21
Dr. Bödecker's paper passed	21
Election of officers, time fixed for	21
Dr. Kingsley's address	21
Section I. further discussed and passed	21
Section II. called and report read	22
Motion to adopt resolution offered by Section II.	22
Motion to amend said resolution	22
Motion to further amend the same	22
Resolution offered by Section II. as finally amended and adopted	22
Resolution recommending Dental Schools to require preliminary examination of students	22

PAGE

Resolution opposing the conferring of titles or degrees by State Boards of Examiners 22
Report of Section II. adopted 22
Section II. passed 22
Memorial Committee's report on death of Dr. Goddard 23
Memorial Committee's report on death of Dr. Allen 23
Section III. called and reports read 23
Motion to incorporate paper of Dr. C. E. Francis in report of Section III. . 23
Section III. passed 23
Report of Committee on Voluntary Essays 23
Election of officers 24
Organization of Sections 24
Invitation to attend the Southern Dental Association 25
Officers installed 25
Thanks of the Association to various parties 25
Instructions to Secretary to draw orders 26
Salary of the Secretary fixed 26
Section IV. called 26
Motion to limit speakers to five minutes 26
Motion to reconsider the vote awarding the prize of two hundred dollars, and action thereon 26
Treasurer's report 26
Auditing of reports of Treasurer and Publication Committee 27
Instruction to Secretary to appoint chairman and secretary of Sections . 27
Thanks voted 27
Local Committee of Arrangements appointed 27
Publication Committee appointed 27
Memorial pages 28–32

REPORTS AND VOLUNTEER PAPERS.

President's address 33

Section VI.

Paper on Syphilitic Teeth, by A. G. Friedrichs 36
Paper on Treatment of Pyorrhea Alveolaris, by A. W. Harlan 40

Section V.

Paper on the Action of Arsenious Acid, by C. F. W. Bödecker 55

Section VII.

Report, by W. C. Barrett, Chairman 67

Section I.

Report, by T. L. Buckingham, Chairman 70

Section II.

Report, by C. N. Peirce, Chairman *pro tem.* 83

SECTION III.

PAGE

Report, by J. Taft, Chairman 91
Paper, by W. H. Atkinson 99

SECTION IV.

Report, by E. T. Darby, Chairman 106

DISCUSSIONS.

SECTION VI.

Paper on Syphilitic Teeth—discussed by
Dr. Atkinson 44, 47
Dr. Peirce 45, 48
Dr. Darby 48, 49
Dr. Kingsley 49
Dr. Abbott 49
Dr. Barrett 49

Pyorrhea Alveolaris—discussed by
Dr. Bödecker 50
Dr. Darby 51
Dr. Abbott 52, 53
Dr. I. P. Wilson 52
Dr. Harlan 52
Dr. Atkinson 52
Dr. Daboll 53
Dr. Peirce 54

SECTION V.

Action of Arsenious Acid—discussed by
Dr. Peirce 60
Dr. Bödecker 61, 62, 63
Dr. Horton 61, 66
Dr. Watkins 61
Dr. Allport 61, 62
Dr. Abbott 62
Dr. Taft 62, 63, 65
Dr. Buckingham 64
Dr. E. Parmly Brown 64, 66
Dr. Park 65
Dr. Richardson 65
Dr. Atkinson 66

SECTION I.

Chemistry—discussed by
Dr. Buckingham 70

Artificial Dentistry—discussed by
Dr. W. H. Trueman 71
Dr. Stockton 73, 80
Dr. Bödecker 74
Dr. Priest 74

PAGE

Dr. Matteson 74
Dr. Kingsley 76, 79
Dr. Thomas 79
Dr. Watkins 80
Dr. Harroun 80
Dr. Dickerman 80
Dr. Horton 80
Dr. Cravens 80
Dr. Morrison 81
Dr. E. Parmly Brown 81
Dr. How 81
Dr. Barrett 81

SECTION II.

Education—discussed by
Dr. Hayhurst 85, 86, 90
Dr. Crouse 85, 88
Dr. Atkinson 85
Dr. Peirce 86, 87, 89
Dr. Buckingham 86, 89
Dr. Cushing 86
Dr. Allport 86, 88, 90
Dr. Barrett 86
Dr. Stockton 87
Dr. Marcklein 88
Dr. Rehwinkel 89

SECTION III.

Literature and Nomenclature—discussed by
Dr. Crouse 104, 105
Dr. Abbott 105
Dr. Moore 105

SECTION IV.

Operative Dentistry—discussed by
Dr. Taft 106
Dr. Horton 107, 108
Dr. Watkins 108, 109, 117
Dr. Rhein 108
Dr. Stockton 110
Dr. Buckingham 111
Dr. S. G. Perry 112, 116
Dr. Crouse 113
Dr. Peirce 114
Dr. Harlan 114, 115
Dr. V. H. Jackson 115, 116
Dr. Callahan 115
Dr. Atkinson 116
Dr. Marcklein 117
Dr. Priest 117

MINUTES OF TRANSACTIONS

OF THE

AMERICAN DENTAL ASSOCIATION.

SESSION OF 1883.

BY GEO. H. CUSHING, SECRETARY.

FIRST DAY—MORNING SESSION.

THE AMERICAN DENTAL ASSOCIATON commenced its Twenty-third Annual Session at the International Hotel, Niagara Falls, N. Y., on Tuesday, August 7, 1883, at 11 o'clock A.M., the first Vice-President, Geo. J. Friedrichs, in the chair.

The roll was then called, and the following were found either to be present or to have forwarded their dues:

ATKINSON, W. H.	41 East Ninth st., New York.
ABBOTT, FRANK	22 West Fortieth st., New York.
ALLEN, E. H.	Freeport, Ill.
ALLEN, JOHN	7 West Thirty-third st., New York.
ALLPORT, W. W.	240 Wabash ave., Chicago.
AMES, W. B.	84 Monroe st., Chicago.
BUCKINGHAM, T. L.	1228 Arch st., Philadelphia.
BROWN, S. B.	Fort Wayne, Ind.
BARRETT, W. C.	11 West Chippewa st., Buffalo, N. Y.
BUTLER, C. R.	519 Euclid ave., Cleveland, Ohio.
BAIRD, W. H.	Burlington, Iowa.
*BAUER, JOSEPH	130 Esplanade st., New Orleans, La.
BISHOP, J. ADAMS	32 West Thirty-sixth st., New York.
BÖDECKER, C. F. W.	60 East Fifty-eighth st., New York.
BOGUE, E. A.	29 East Twentieth st., New York.
BROWN, E. PARMLY	Flushing, Long Island, N. Y.
BOICE, ALONZO	1612 Vine st., Philadelphia.
*BRACKETT, C. A.	102 Touro st., Newport, R. I.

Those marked (*) were absent but sent their dues.
Those marked thus (d) were delegates.

CARPENTER, L. D.	Atlanta, Ga.
CROUSE, J. N.	2101 Michigan ave., Chicago.
COWIE, HENRY	Detroit, Mich.
CUSHING, G. H.	84 Monroe st., Chicago.
CLIFTON, W. R.	Waco, Texas.
COYLE, JOHN H.	Thomasville, Ga.
CRAVENS, J. E.	Indianapolis, Ind.
CHAPPELL, M. H.	Knightstown, Ind.
COOK, C. D.	188 Pacific st., Brooklyn, N. Y.
CALLAHAN, J. R.	Hillsboro', Ohio.
COOLIDGE, J. B.	230½ Tremont st., Boston.
COLTON, AARON	Hudson, New York.
CLELAND, JAMES	Detroit, Mich.
DARBY, E. T.	1518 Walnut st., Philadelphia.
DUDLEY, A. M.	304 Essex st., Salem, Mass.
DICKERMAN, D. S.	Taunton, Mass.
* DORRANCE, W. H.	Ann Arbor, Mich.
DABOLL, G. C.	Buffalo, N. Y.
d DEGENHARDT, CHARLES	128 Avenue A, New York.
DEVORE, J. H.	Corry, Pa.
FRIEDRICHS, GEO. J.	155 St. Charles st., New Orleans.
FRIEDRICHS, A. G.	155 St. Charles st., New Orleans.
FRANCIS, C. E.	33 West Forty-seventh st., New York.
FIELD, G. L.	Detroit, Mich.
* FARRAR, J. N.	1271 Broadway, New York.
FREEMAN, S. A.	14 Court st., Buffalo, N. Y.
FUNDENBURG, W. H.	823 Penn ave., Pittsburg, Pa.
GARDINER, FRANK H.	126 State st., Chicago.
GILMER, T. L.	Quincy, Ill.
* GAYLORD, E. S.	New Haven, Conn.
HOW, W. S.	Chestnut st., cor. 12th, Philadelphia.
HORTON, W. P.	Cleveland, Ohio.
HARLAN, A. W.	70 Dearborn st., Chicago.
HAYHURST, J.	Lambertville, N. J.
* HILL, J. L.	Gettysburg, Pa.
HACKER, T. S.	Indianapolis, Ind.
HOYSRADT, G. W.	Ithaca, N. Y.
* HUNTER, FRANK A.	123 West Seventh st., Cincinnati.
HUNT, P. G. C.	Indianapolis, Ind.
HUNT, A. O.	Iowa City, Iowa.
HOWARD, C. T.	15 Chestnut st., Rochester, N. Y.
HAMSHER, F. M.	Delphi, Ind.
HARROUN, C. H.	Toledo, Ohio.
* INGERSOLL, L. C.	Keokuk, Iowa.
JACKSON, H. H.	319 Jefferson st., Detroit, Mich.
JACKSON, V. H.	51 East One Hundred and Twenty-Fifth st., New York.

KEELY, GEORGE W.	Cor. High and Main sts., Oxford, Ohio.
KEELY, CHARLES I.	Cor. High and Third sts , Hamilton, O.
d KING, W. Z.	Chico, Cal.
KINGSLEY, N. W.	25 West Twenty-seventh st., New York.
* KLUMP, G. W.	Williamsport, Penn.
* KINGSBURY, C. A.	1119 Walnut st., Philadelphia.
* LATHROP, JOS.	152 Woodward ave., Detroit, Mich.
LINE, J. E.	Rochester, N. Y.
LOWRY, M. B.	Brookville, Pa.
* LEITER, THOS. C.	Wadsworth, Ohio.
MOORE, E. C.	22 Lafayette ave., Detroit, Mich.
MOORE, THOS. T.	Columbia, South Carolina.
MORRISON, W. N.	1337 Washington ave., St. Louis.
MARCKLEIN, B. G.	Iron Block, Milwaukee, Wis.
MCELHANEY, G. W.	Columbus, Ga.
MATTESON, A. E.	3700 Cottage Grove ave., Chicago.
* MORGAN, HENRY W.	Nashville, Tenn.
MCKELLOPS, H. J.	2630 Washington ave., St. Louis.
MARRINER, J. FRANK	Ottawa, Ill.
MCMANUS, JAMES	Hartford, Conn.
ODELL, F. M.	7 West Thirty-eighth st., New York.
PEIRCE, C. N.	1415 Walnut st., Philadelphia.
* PALMER, S. B.	39½ Warren st., Syracuse, N. Y.
PERRY, S. G.	10 East Thirty-fourth st., New York.
PATTERSON, J. D.	Lawrence, Kansas.
PRIEST, A. N.	Utica, N. Y.
PARK, EDGAR	1418 Washington ave., St. Louis.
PETERSON, DENTON E.	Waterloo, N. Y.
PAGE, W. E.	110 Tremont st., Boston.
REHWINKEL, F. H.	Chillicothe, Ohio.
RHEIN, MEYER L.	7 West Thirty-eighth st., New York.
ROBINSON, J. A.	Jackson, Mich.
SAUNDERS, BOYD G.	Rochester, N. Y.
* STARBUCK, W. C.	Jamaica Plain, Mass.
* SHEPARD, L. D.	100 Boylston st., Boston.
SMITH, H. A.	286 Race st., Cincinnati.
SMITH, J. H.	New Haven, Conn.
STOCKTON, C. S.	Newark, N. J.
TRUEMAN, W. H.	900 Spruce st., Philadelphia.
* TALBOT, E. S.	125 State st., Chicago.
TAFT, J.	122 West Seventh st., Cincinnati.
THOMAS, G. R.	Detroit, Mich.
* TILLINGHAST, W. H.	220 Westminster st., Providence, R. I.
VIET, MARTIN	12 Dauphine st., New Orleans.
* WENDEL, WM. C.	Room 2, Iron Block, Milwaukee, Wis.
WILLIAMS, I.	New Philadelphia, Ohio.
WATKINS, S. C. G.	Montclair, N. J.

WOODWARD, W. B. . . .	Peoria, Ill.
* WATERS, G. F.	8 Beacon st., Boston.
WILSON, I. P.	Burlington, Iowa.
WATLING, J. A.	Ypsilanti, Mich.
WADSWORTH, T. A. . . .	68 West Thirty-seventh st., New York.
WHITE, SAMUEL A. . . .	Savannah, Ga.

On motion the reading of the printed minutes was dispensed with.

The first Vice-President, Dr. Friedrichs, then made a brief address.

The following amendment to the Constitution, proposed last year, was then adopted:

To add to Section 7 of Article V. the following: "All resolutions appropriating money, except for the legitimate expenses of this Association, shall require a two-thirds vote of all the members present."

The following amendment offered last year by Dr. Allport was indefinitely postponed:

To amend Article V. Section 1, as follows: In line *four*, after the words, "Executive Committee," strike out all the remaining section, and insert, "All candidates for office shall be put in nomination by a committee appointed for that purpose, consisting of one member from each Section of the Association appointed by such Section, who shall put in nomination three candidates for each office of the Association. When the nominations are made, the election shall be by ballot in the order named in the Constitution. In case no candidate receives a majority of all the votes on the first ballot, the candidate receiving the lowest number of votes shall be dropped, and the ballot shall be taken upon the two remaining candidates, and the one receiving a majority of the votes shall be declared elected."

The Executive Committee reported, recommending the following:

That the afternoon of to-day be devoted to the work of Sections; that after to-day the meetings be held from 9 A. M. till 2 P. M., and from 8 P. M. till adjournment.

Adopted.

The Committee on Credentials made a partial report, which was subsequently completed and adopted, as follows:

California State Dental Society—W. Z. King.
Chicago Dental Society—J. N. Crouse, A. E. Matteson, Frank H. Gardiner, W. B. Ames.
Detroit Dental Society—Henry Cowie, E. C. Moore.
First District Dental Society of the State of New York—W. H. Atkinson, T. A. Wadsworth, Chas. Degenhardt, V. H. Jackson, C. F. W. Bödecker.
Georgia State Dental Society—John H. Coyle, Geo. W. McElhaney, Samuel A. White.
Illinois State Dental Society—A. W. Harlan, Geo. H. Cushing, E. H. Allen, W. B. Woodward, T. L. Gilmer, J. Frank Marriner.
Indiana State Dental Association—S. B. Brown, J. E. Cravens, T. S. Hacker, M. H. Chappell, F. M. Hamsher.
Iowa State Dental Association—W. H. Baird, A. O. Hunt, I. P. Wilson.
Kansas State Dental Association—Jno. D. Patterson.
Lake Erie Dental Society—J. H. Devore.
Michigan State Dental Society—Denton E. Peterson.
New England Dental Society—A. M. Dudley.
New Jersey State Dental Society—Frank M. Odell, J. Hayhurst, S. C. G. Watkins.
New Orleans Odontological Society—Andrew G. Friedrichs, Martin Viet.
New York Odontological Society—Frank Abbott, N. W. Kingsley, E. A. Bogue.
Northern Ohio Dental Association—C. R. Butler.
Odontographic Society of Pennsylvania—Alonzo Boice.
Odontological Society of Western Pennsylvania—M. B. Lowry.
Ohio State Dental Society—Geo. W. Keely.
Pennsylvania Association of Dental Surgeons—Wm. H. Trueman, T. L. Buckingham.
St. Louis Dental Society—W. N. Morrison, Edgar Park.
Second District Dental Society of the State of New York—E. Parmly Brown.
Seventh District Dental Society of the State of New York—B. G. Saunders, C. T Howard.
The Dental Society of the State of New York—J. Edward Line.
Texas State Dental Association—W. R. Clifton.
Wisconsin State Dental Society—B. G. Marcklein.

The following report of the Publication Committee was then read and referred to the Executive Committee:

The Publication Committee would report that, under the instructions of the Association, they made arrangements with The S. S. White Dental Manufacturing Co. whereby the Transactions were furnished by that company without cost to the Association, and the committee wish to express their thanks to Mr. Hise for the careful supervision of his part of the work.

The Transactions were mailed in the latter part of January, 1883, to all the members entitled to them, as also to various libraries, universities, journals, and all honorary members, leaving in the hands of the Secretary about fifty copies.

The following is the account of receipts and expenditures by the Committee:

Received of Treasurer		$30 00
Expended for expressage, wrapping-paper, copying and stationery..	$9 45	
Postal-cards and printing notices and pasters	4 25	
Postage	18 00	31 70
Leaving balance due the Committee		1 70

All of which is respectfully submitted.

GEO. H. CUSHING, *Chairman.*

NIAGARA FALLS, Aug. 7, 1883.

We have examined the above and find it correct.

J. N. CROUSE,
A. M. DUDLEY, } *Auditing Com.*

On motion of Dr. Peirce the following were appointed to draft a memorial on the death of Dr. Marshall H. Webb: Drs. C. N. Peirce, E. T. Darby, and S. G. Perry.

On motion of Dr. Rehwinkel the following were appointed to prepare resolutions on the death of the late President, Dr. Wm. H. Goddard: Drs. F. H. Rehwinkel, J. Taft, and G. W. McElhaney.

On motion of Dr. Odell the following were appointed to prepare resolutions touching the death of Dr. W. H. Allen: Drs. F. M. Odell, W. H. Atkinson, and C. S. Stockton.

On motion of Dr. Priest the thanks of the Association were tendered to The S. S. White Dental Manufacturing Co., for the prompt and satisfactory manner in which they have furnished the Transactions to this Association.

Sections were then called, and place and time of their meetings were fixed.

Adjourned to meet at 9 A.M. to-morrow.

SECOND DAY—MORNING SESSION.

The Association met at 9.30. Dr. Friedrichs in the chair.

The minutes were read and approved.

The committee on the memorial to Dr. M. H. Webb submitted their report, which was adopted, and will be found in the memorial pages.

Remarks were made by Dr. J. Taft.

Section V. being called was not ready to report.

Section VI. was then called, and a paper was read by Dr. A. G. Friedrichs, of New Orleans, on "Syphilitic Teeth."

Discussed by Drs. Atkinson, Peirce, Darby, Kingsley, Abbott, Park and Barrett.

Dr. Harlan then read a paper on the "Treatment of Pyorrhea Alveolaris."

Discussed by Drs. Bödecker, Darby, Abbott, Wilson, Atkinson, Daboll, and Peirce.

On motion Section VI. was passed.

On motion of Dr. Horton, Section V. was again called, and Dr. Bödecker read a paper on the "Action of Arsenious Acid on Dentinal and Pulp Tissue."

On motion the discussion of this paper was made the first order for this evening.

Section VII. being called, a report was read by Dr. Barrett, chairman.

Section VII. was on motion passed, and Section I. was called, and Dr. Buckingham, the chairman, made a report, which was adopted.

Remarks were then made by Drs. Buckingham, Trueman and Stockton.

After which Dr. Atkinson introduced Mr. Richardson, of London, England, who was accorded the privileges of the floor.

Section I. was further discussed by Drs. Bödecker, Priest, and Matteson.

On motion the regular order was suspended and miscellaneous business was taken up.

Dr. Odell offered the following:

Resolved, That it is the special request of the American Dental Association that exhibitors of dental instruments and supplies close their doors and keep them closed during the sessions of this body.

Adopted.

On motion of the same gentleman the following was adopted:

Resolved, That hereafter the calling of the Sections shall be in regular progressive numerical order, and in case any Section is not ready to report when called, such Section shall be passed without recall until it again comes up in its regular order.

The Committee on Credentials made a supplementary report.

The Secretary announced that Dr. Bödecker would be present and exhibit his specimens with the microscope at 7 P.M. in this room.

Adjourned till 8 this evening.

SECOND DAY—EVENING SESSION.

The Association met at 8.30 P.M. Dr. Friedrichs in the chair.

The minutes of the morning's session were read and approved.

Under the call for miscellaneous business the Committee on Prize Essays made their report, which was accepted and discussed by Drs. Butler, Crouse, Atkinson, Barrett, and Horton, and finally adopted, as follows:

Your committee, to whom was assigned the duty of deciding upon the merits of essays upon the etiology of dental caries, presented in competition for a prize of two hundred dollars, which was last year appropriated by this Association for the purpose, would respectfully report that but one essay has been received, and that from the hands of Dr. W. D. Miller, of Berlin, Germany.

The committee have carefully read this, and, while the views contained therein are not original, many of his experiments, which are in detail and made for the purpose of confirming his theory, have not been previously published. Your committee would therefore, in view of the original work which the author has prosecuted during the past two years, the results of which are given in this paper, award to the essayist the two hundred dollars appropriated for the purpose.

Signed by Committee, { C. N. PEIRCE, *Chairman.*
E. T. DARBY.
H. A. SMITH.

The special order for the evening, being the consideration of Dr. Bödecker's paper, was then called, and the following took part in the discussion: Drs. Bödecker, Peirce, Horton, Buckingham, Watkins, Allport, Abbott, Taft, E. Parmly Brown, Park, Richardson of London, and Atkinson.

On motion the subject was passed.

On motion the time for fixing the place of next meeting and the election of officers was set for to-morrow (Thursday) evening at 8 o'clock.

Dr. Kingsley then addressed the Association on the subject of Correcting Imperfect Speech by Mechanical Appliances.

On motion adjourned till 9 A.M. to-morrow.

THIRD DAY—MORNING SESSION.

The Association met at 9.45 A.M. Dr. Friedrichs in the chair.

The minutes of the evening session were read and approved.

The Committee on Credentials made a further supplementary report.

Section I., the regular order, being called, was further discussed by Drs. Watkins, Stockton, Harroun, Dickerman, Cravens, Morrison, Perry, E. Parmly Brown, Buckingham, and How.

On motion the Section was passed.

Section II. being called, its report was read by Dr. C. N. Peirce, chairman *pro tem.*

Discussed by Dr. Hayhurst, when a motion was made that the resolution offered in the report be adopted.

Dr. Peirce moved to amend the resolution by striking out the last three words.

Discussed by Drs. Hayhurst, Barrett, and Stockton.

Dr. Allport moved to further amend by striking out the words "or Master."

Dr. Peirce accepted Dr. Allport's amendment, so that the motion now stands—that the report be amended by striking out the words after Doctor "or Master," and the last three words—"or its Equivalent." Adopted. And the resolution as amended was then adopted as follows:

Resolved, That the interests of the profession and advanced dental education both demand that all dental educational institutions shall require that every student, before being admitted to examination for the degree of Doctor of Dental Surgery, shall have taken two full courses of lectures.

Dr. Rhein offered the following:

Resolved, That the American Dental Association recommend to every dental educational institution the necessity of requiring a thorough preliminary examination before admitting any person as a student of the college.

Dr. Peirce offered the following, which was unanimously adopted:

Resolved, That the American Dental Association deems it adverse to the interest of the dental profession for any State board of examiners to confer a title or degree of any nature.

Education was further discussed by Drs. Rehwinkel, Peirce, Allport, and Hayhurst.

On motion the report of Section II. as a whole was adopted.

On motion the subject was passed and the regular order sus-

pended, in order to hear the report on the death of our late presiding officer, Dr. W. H. Goddard.

The report was adopted by a rising vote, and will be found in the memorial pages.

The report of the committee on the death of Dr. W. H. Allen was also presented and adopted by a rising vote, and will be found in the memorial pages.

Section III. being called, Dr. Taft read a report on Literature and Nomenclature. Dr. Atkinson then read a report on Nomenclature, and was followed by Dr. Taft, who read a paper also on Nomenclature, written by Dr. Geo. J. Friedrichs.

Dr. Butler moved that Dr. Francis's paper, which was not read, be incorporated in the report by Dr. Taft, of Section III., in the discretion of the Publication Committee. Carried. Dr. Friedrichs's paper was also to be incorporated in the report.

Section III. was discussed by Drs. Crouse, Abbott, and Moore.

On motion of Dr. Odell Section III. was passed.

The Committee on Voluntary Essays reported that they had in their hands a paper by E. Parmly Brown, on "Dentistry; its Past its Encouraging Present, and Brilliant Future," and recommended that it be read.

It was voted to hear the paper at once.

Dr. Brown not responding to the call the Association adjourned to meet at 8 P.M.

THIRD DAY—EVENING SESSION.

The Association met at 8 P.M. Dr. Friedrichs in the chair.

The minutes of the morning session were read and approved.

The special order for the evening being the selection of the next place of meeting and election of officers, the Executive Committee reported the names of Washington, Saratoga, and St. Louis. Saratoga was selected on the first ballot.

The Association then proceeded to ballot for officers, and elected the following:

President—E. T. Darby, of Philadelphia.
First Vice-President—C. S. Stockton, of Newark, N. J.
Second Vice-President—T. T. Moore, of Columbia, S. C.
Corresponding Secretary—A. W. Harlan, of Chicago.
Recording Secretary—Geo. H. Cushing, of Chicago.
Treasurer—Geo. W. Keely, of Oxford, Ohio.
Executive Committee—S. G. Perry, of New York; Geo. J. Friedrichs, of New Orleans; W. N. Morrison, of St. Louis.

The Sections were then called and organized as follows:

SECTION I. Artificial Dentistry, Chemistry, and Metallurgy.—W. H. Trueman, chairman; C. S. Stockton, secretary; J. Hayhurst, C. H. Harroun, A. O. Hunt, Alonzo Boice, W. H. Dorrance, S. A. Freeman, J. D. Patterson, Geo. S. Shepard, Thos. C. Leiter, John Allen, W. B. Ames, W. W. Evans, Henry Cowie, T. S. Hacker, C. T. Howard, H. H. Jackson, Jos. Lathrop, A. E. Matteson, H. B. Noble, J. W. Rhone, S. W. Dennis, Boyd G. Saunders, J. A. Robinson, J. A. Watling, E. Honsinger, D. D. Smith, H. H. Keith, J. G. Harper.

SECTION II. Dental Education.—C. N. Peirce, chairman; J. N. Crouse, C. D. Cook, D. S. Dickerman, W. N. Morrison, G. R. Thomas, G. W. McElhaney, J. Frank Marriner, W. H. Morgan, K. B. Davis, C. J. Essig, J. G. Templeton, T. W. Brophy, Thos. Fillebrown.

SECTION III. Dental Literature and Nomenclature.—J. Taft, chairman; F. H. Rehwinkel, secretary; W. H. Colgrove, A. L. Northrop, E. A. Bogue, C. E. Francis.

SECTION IV. Operative Dentistry.—E. T. Darby, chairman; H. J. McKellops, secretary; J. E. Cravens, T. T. Moore, Geo. L. Field, S. C. G. Watkins, B. G. Marcklein, S. G. Perry, J. R. Callahan, W. R. Clifton, E. C. Moore, C. I. Keely, Geo. W. Keely, Edgar Park, A. N. Priest, E. H. Allen, F. M. Hamsher, W. B. Woodward, C. R. Butler, E. Parmly Brown, J. B. Coolidge, W. C. Starbuck, W. E. Page, W. H. Baird, Jas. McManus, I. Williams, W. O. Kulp, M. F. Finley, J. R. Clayton, Eugene H. Smith, L. D. Shepard, S. B. Palmer, P. G. C. Hunt, G. W. Klump, W. H. Tillinghast, Sam'l A. White, A. F. Emminger, J. H. Boger, O. N. Heise, D. J. Pollock, S. B. Brown, J. Adams Bishop, J. L. Hill, G. W. Hoysradt, F. A. Hunter, V. H. Jackson, J. H. Smith, Wm. Dutch, D. W. Clancy, A. Wilkes Smith, S. D. Stewart, Ira Brown, S. A. Garber.

SECTION. V. Anatomy, Histology, and Microscopy.—M. L. Rhein, chairman; J. Edward Line, secretary; Frank Abbott, C. F. W. Bödecker, Geo. H. Cushing,

T. L. Gilmer, Geo. F. Waters, A. Colton, James Cleland, J. C. Whinery, Geo. H. Wilson, H. C. Meriam, R. R. Andrews, E. D. Swain, A. H. Brockway, L. G. Noel.

SECTION VI. Pathology, Therapeutics, and Materia Medica.—A. W. Harlan, chairman; F. M. Odell, secretary; A. G. Friedrichs, M. Viet, Geo. J. Friedrichs, A. M. Dudley, M. B. Lowry, G. C. Daboll, C. A. Brackett, T. A. Wadsworth, M. H. Chappell, Otto Arnold, G. A. Mills, W. W. Allport, C. A. Kingsbury, C. S. Beck, Chas. P. Pruyn, J. H. Devore, Frank H. Gardiner, Saml. E. Knowles, D. C. McNaughton, J. Hooper, A. W. Freeman, A. O. Rawls, E. Noyes, C. A. Kitchen.

SECTION VII. Physiology and Etiology.—W. C. Barrett, chairman; H. A. Smith, secretary; W. Storer How, W. P. Horton, I. P. Wilson, Denton E. Peterson, L. C. Ingersoll, J. N. Farrar, N. W. Kingsley, J. H. Coyle, Henry W. Morgan, C. M. Wright, W. H. Fundenburg, E. S. Talbot, Gale French, J. G. W. Werner, F. H. Waldron, S. E. Davenport, W. D. Kempton, E. G. Betty.

Adjourned to meet at 9 A.M. to-morrow.

FOURTH DAY—MORNING SESSION.

The Association met at 9.30 A.M. President elect, E. T. Darby in the chair.

The minutes of last evening's session were read and approved.

The Committee on Credentials made their final report, which was adopted.

Dr. McKellops, President of the Southern Dental Association, extended, on behalf of that body, a most hearty invitation to this Association to meet with them at their next meeting to be held at Lexington, Kentucky, on the first Tuesday of May, 1884, with the assurance that "the latch-string would always hang on the outside."

On motion the newly-elected officers were installed, and Drs. Rehwinkel and McKellops were appointed to conduct the lately elected President to the chair.

On motion the thanks of the Association were extended to Dr. Friedrichs, the retiring President; also, to the Secretary and Treasurer and the Local Committee of Arrangements, and particularly to Dr. Gates, of Niagara Falls, for his many and courteous favors.

On motion the Secretary was instructed to draw orders on the Treasurer for the payment of all bills properly due.

Upon the recommendation of the Executive Committee, by motion which prevailed, the salary of the Secretary was increased to two hundred dollars, the increase to apply to the year last past.

The regular order was now taken up, and the report of Section IV. was read by the chairman, Dr. E. T. Darby.

Discussed by Drs. Taft, Horton, and Watkins.

On motion it was voted that speakers shall be limited to five minutes and shall speak but once.

Subject was further discussed by Drs. Rhein, Stockton, Buckingham, Perry, Crouse, Atkinson, Peirce, Harlan, Callahan, Jackson, Marcklein, and Priest.

On motion the rules were suspended in order to transact some miscellaneous business.

Dr. Rehwinkel moved a reconsideration of the resolution adopted yesterday, which awarded the prize of two hundred dollars as recommended by the Committee on Prize Essays.

The motion prevailed.

Dr. Atkinson moved that the subject be referred to the same or some other Committee. Carried.

On motion it was submitted to the same Committee, they to report next year.

The Treasurer's report was submitted, as follows:

Geo. W. Keely, Treasurer, in account with the American Dental Association.

Dr.	To balance on hand August 5, 1882	$1446.60
	Received since last meeting	95.00
	Received dues this year	635.00
		$2176.60

Cr. By paid G. H. Cushing, Chairman Publication Committee, for incidental expenses	$30.00
Paid A. Cluck for use of parlor for this meeting	50.00
G. L. Field, expenses of Committee of Arrangements	16.45
Geo. H. Cushing, salary as Secretary	200.00
Geo. H. Cushing, for reporter	125.00
Geo. H. Cushing, balance on last year	1.70
Geo. W. Keely, salary as Treasurer	100.00
Geo. W. Keely, postage and expressage	5.75
	$528.90
Balance on hand	1647.70
	$2176.60

Approved: J. N. Crouse, A. M. Dudley, S. G. Perry, *Auditing Committee.*

The Executive Committee reported that they had audited the reports of the Treasurer and the Publication Committee and found them correct.

The report was adopted.

On motion the Secretary was instructed to designate the chairman and secretary of any Section which fails to organize at this meeting.

A vote of thanks was tendered to the hotels, the press, the proprietors of Prospect Park and Goat Island, and the railroads, for courtesies shown this Association.

The President appointed as the Local Committee of Arrangements M. L. Rhein, chairman; F. M. Odell and C. F. Rich.

He also appointed on the Publication Committee A. W. Harlan and S. G. Perry.

The minutes were then read and approved, and on motion the Association adjourned to meet at Saratoga on the first Tuesday in August, 1884.

Geo. H. Cushing, *Secretary.*

IN MEMORIAM.

WM. H. GODDARD.

The chair of our President is draped with the insignia of grief and mourning, indicating that its proper occupant is not with us, and that this Association has met with bereavement.

Dr. Wm. H. Goddard, President of this Association, is no more. He died at his home in the city of Louisville, Ky., on the morning of March 4, 1883, after a prolonged illness and great sufferings.

Aside from the fact that it is the first officer of this Association whose loss we mourn, the character of our friend and colleague, as a man, was such that this Association honors itself by giving expression to its feelings of sincere and heartfelt sorrow at his death, and its profound respect for and appreciation of his many noble and manly traits of character. He was the personification of honor and integrity; conscientious and exact—even to apparent sternness—in the fulfilment of duties, either assigned to him or voluntarily assumed.

Though modest and unpretending, yet he was possessed of that manly independence of thought and opinion which enabled him to become on important occasions a valuable counsellor. Among his peers, he was positive and strong in asserting and defending his convictions, yet never arrogant or overbearing in his manner.

In his exterior, our friend was not endowed by nature with that smooth and polished suavity of manner and address which attracts and charms at first sight, yet his excellence and strength of character soon won for him friends and honors. With all his apparent sternness of manner, he was at heart exceedingly kind and gentle.

Honors came to him unsought; and whatever station in life he occupied or whatever trusts he administered, he was honest and faithful. His death is mourned by many who have lost in him a guardian, trustee, adviser, or friend.

In his family circle and among his more intimate friends, he was kind and affectionate. He was at times quite humorous, and well enjoyed an innocent practical joke.

We all know what he was to the American Dental Association,—for fourteen successive years its Treasurer, until finally called to take the gavel and be its President. Many of us have reason to remember him as an impartial but exact and unflinching officer.

In his profession he strove to be abreast of the times; there was no standing still or retrograde movement with him; he was always up and doing. His career in life has been an interesting and eventful one, and would furnish material for an extended obituary. This has already been written by able and loving friends.

In token of our affectionate regard for our departed brother, let a page of our records receive this our memorial and the expression of the sincerest sorrow of this Association at his demise.

Let his widow and family receive the assurance of our sympathy and condolence with them in their bereavement and distress, and our best wishes for their future welfare.

WILLIAM H. ALLEN.

WHEREAS, We are called upon to mourn the loss of our estimable friend and co-member and former President of this Association; it is therefore

Resolved, That in the demise of William H. Allen we have sustained a great loss. And that we sincerely sympathize with his family in this visitation, and that a page be set aside in the records of this Association as a memorial of our respect and esteem. And further, that a copy of these resolutions be forwarded to the family of the deceased.

William H. Allen, who departed this life on Monday, October 23, 1882, at the age of sixty-two, was one of the remarkable and representative men of the age.

By his father, Samuel Allen, a well-known mechanician, inventor, and civil engineer of eastern Massachusetts, he was descended from the renowned Gen. Ethan Allen, of Revolutionary fame.

His grandmother was sister of President Marcy, of Brown University.

Commencing with an ordinary common-school education, he, in 1838, pursued an academic course of one year at Norwich, Conn. In the autumn of 1839 he commenced the study of the profession of dentistry with his elder brother and associate, then constituting the firm of Hawes & Allen, at Park place, New York.

Drs. Hawes and Allen were leading men in the profession; the latter, Dr. Chas. C. Allen, being for many years editor of the first dental journal established in the State of New York, *The Dental Recorder*.

After completing his course of study with Hawes & Allen, the subject of this sketch settled in Norwich, Conn., and enjoyed a large and successful practice for seventeen years.

On account of ill-health he spent the winter of 1849–50 in the Southern States, returning in the spring; but in 1851, for the same reason, he sailed for Buenos Ayres, and after narrowly escaping death by shipwreck arrived at Montevideo, February 4, 1852, the same day that Rosas was deposed. Exhibiting his diploma from the Society of Dental Surgeons of the State of New York to the Medical Junta he was allowed to practice without the usual examination and fee. He remained at Montevideo during the year practicing in his profession, and then with renewed health he returned to Norwich, Conn., where he remained until 1856, when at the solicitation of his brother he came to New York; as the event proved, to succeed him in business; Dr. Chas. C. Allen dying in 1857.

William H. Allen was one of the incorporators of the New York College of Dentistry; a trustee of that institution, and at the time of his death and for sev-

eral years previously, president of the board. He delivered the first clinical lecture in that institution, and has ever since been an active member of the clinical board.

He was ever one of the first to adopt and adapt new ideas and appliances as they arose and could be made serviceable, and many years ago acquired a reputation in the restoration of broken-down and worn teeth to their normal length and contour by building with gold. This operation is now quite common; but twenty-four years ago, when he performed successfully the most extensive operations of the kind which had yet been attempted, restoring almost entire arches of dental organs to usefulness, dentists of the first standing would not believe the reports of cases submitted by him; and in one instance a deputation was appointed to call upon one of his patients and ascertain whether he told the truth. The report was like that made by the Queen of Sheba.

Being always favorable to whatever promoted dental education, his voice was always in the affirmative for "association," and elevation of the standard of excellence in dental instruction and practice.

The Brooklyn Dental Society, for years a lively and instructive association, was inaugurated in his office, No. 18 West Eleventh street. He was president of the First District Dental Society of the State of New York for two years; unanimously elected a life member of the New York State Dental Society; member of the Academy of Dental Science of Boston; corresponding member of the Odontographic Society of Philadelphia, and in 1863 was unanimously elected President of the American Dental Association.

He had a fine tenor voice and was a skilled performer upon the violin, which two favorite means of enjoyment were turned to good account by him, in that he was at various times leader and conductor of the first orchestra in Connecticut; conductor of a church choir; for several years leading tenor of Christ Church under the pastorate of Rev. Dr. Morgan, now rector of St. Thomas's Church, New York; member of the famous University Quartette Club, of New York city; member and at one time president of the Mendelssohn Union, of New York, and executive officer of the Mendelssohn Union at the time they brought out in connection with Theodore Thomas and his orchestra, Beethoven's "Ninth Symphony."

He obtained several patents for inventions,—all conspicuous for their direct simplicity of construction and perfect adaptability to the end sought to be accomplished.

In disposition he was a man among men; during nearly eleven years of the most intimate business and social connection with him, the writer does not remember a single instance where he ever so far forgot himself as to raise his voice above its ordinary pitch.

There was never a moment when his brain did not dominate his every action.

It was to this quiet reservation of nerve-force that he owed much of his professional success; enabling him to meet his patients with urbanity, control them when undergoing severe treatment, and, with a clearness of judgment seldom equaled, to pick up exactly the right instrument at the right time and make every movement tell in furthering the work in hand.

Like his father, he was a spontaneous mechanician; and whatever he laid his hand to, was as it were by a spontaneous selection done in a manner admitting of little or no possibility of revision for the better.

MARSHALL H. WEBB.

This Association desires permanent record made of the loss incurred by it, and by the dental profession, in the death of their late member, Dr. Marshall H. Webb, whose decease occurred since our last meeting.

Dr. Webb was possessed of such manipulative skill as has been attained by very few dental practitioners. His preëminence in this respect, which was almost universally conceded, was not so much the result of superior natural gifts as of rare concentration and persistence in efforts to excel. He was not content unless in every operation he realized his ideal; and was not only earnest and conscientious, but almost censurably ambitious. He was not satisfied to work as well as the best, not even content to outdo all others, but strove always to improve on his own performances, constantly advancing his standard of requirements.

There was, however, no element of selfishness in his professional labors; his was not an ignoble strife for leadership; he was ready and willing to tell to any student or practitioner the methods by which he reached his results; not only ready and willing but eager to show all the steps of an operation, and never so happy as when he succeeded in awakening or stimulating an ambition in others to acquire a skill equal to his own. In this manner he did much to improve the quality of service in very many dental offices throughout the country.

He has left many followers whose first ideas of thoroughness in dental operations date from the time of their witnessing a clinic by Dr. Webb. These have in turn become centres from which like influences are emanating, and thus, though resting from his labors "his works do follow him."

Resolved, That a copy of the foregoing expression of our loss, and of our appreciation of Dr. Webb's worth, be inscribed upon a memorial page in the Transactions, and that a copy also be sent to the family of our departed friend.

Dr. TAFT: It would seem that some individual expression would be apropriate in addition to this report. There are several aspects of Dr. Webb's character well worthy of thought and reflection.

Not only should we remember what Dr. Webb did as an operator, and what he did in the communication of his methods to others; but we should bear prominently in mind the influence that has gone out from him, and will continue to exert itself in an exemplary way upon the young men of our profession. He was comparatively a young man, and his influence upon the young was great.

But his influence was also acknowledged by all the members of the profession during these later years. We were always glad to recognize his ability, to learn that which he could communicate to us, and to acknowledge the very high attainments which he had reached in his chosen profession.

He has gone; but his example will ever be a point to which young

men of the future should aim. Young men could hardly hope to attain a higher position in efficiency than that attained by Dr. Webb, but all should seek to come as near to it as possible.

Dr. Webb has left us a written record of that which he has accomplished, in the papers which have recently been published by The S. S. White Dental Manufacturing Company. These are very valuable, indeed, not that they constitute a systematic treatise of practical dentistry, but because within them are embraced the leading methods of his practice which will be valuable to every one,—the student and the practitioner as well.

His memory claims our honor; for he labored not for his own aggrandizement, but for the good of the profession and for the establishment of a high standard in dental practice.

ANNUAL ADDRESS.

By G. J. FRIEDRICHS, Acting President.

Gentlemen of the American Dental Association:

By divine permission we are here convened to confer upon the high interests of our profession, but the pleasure which I experience in again beholding so many familiar faces is mingled with emotions of sorrow that from our midst are forever removed three of our best known and most valued members. Dr. William H. Allen, of New York, Dr. Marshall H. Webb, and our late president, Dr. Wm. H. Goddard, since our last reunion have all embarked upon the vast and mysterious ocean of eternity. As the successor of one, as the friend of two of them, and in my official capacity, I feel it my first duty to voice the sentiments of all assembled here and twine one single flower in the wreaths of respect, of love, and of regret already woven in their honor by the profession at large, and by all men by whom eminent attainments, modesty, and true worth are revered and glorified.

Dr. Marshall H. Webb, prominent in his profession, stricken in the prime of life and in the ripeness of his intellectual powers—vain were it here to name his many virtues, or linger amid the details of a career, short but brilliant, and so well known to you all. Indeed, I feel my humble abilities inadequate to accord the meed of justice his memory deserves, though my heart proclaims his worth and our great loss in a language more deep and more eloquent than words. His busy mind and willing hands are now stilled in "death's cold embrace;" the sunshine of his marked personality and his genial ways to those who knew him is forever extinguished; no longer will the accents of his voice, ever freighted with wisdom and goodly advice, be heard at our council board, and as we instinctively turn to greet the once familiar form, absence only too pathetically and too truly reminds us that indeed of him there are

> "Deposited upon the silent shore
> Of memory, images and precious thoughts
> That shall not die and cannot be destroyed."

Our late president, the honored and lamented Wm. H. Goddard, like a noble tree which has withstood the blasts of many winters, but at last succumbs to the sturdy strokes of relentless time and lies prone with all its glorious fruits full upon it, has passed away in the fullness of years.

What happiness, what consolation must fill our breasts upon the reflection that this Association honored him with the highest distinction within its bestowal—one to which his faithful services as its Treasurer for so many years so justly entitled him—a boon which may be honorably craved by any member, and for the enjoyjoyment of which he felt, with a prophetic impulse, that this would be his last opportunity.

Our science has suffered a loss great indeed. True, brighter names may adorn her page; achievements greater than his may shed more lustre upon her; but Dentistry ne'er nurtured a son more true to her principles, more zealous for her advancement, more regardful of her integrity, more worthy of her traditions, or more deserving of her honors.

Gentlemen, membership in your Association was a voluntary act on my part. To cast my feeble abilities with the standard-bearers of our specialty was a duty I felt I owed to the profession of my choice. Imbued with these sentiments, I can scarcely realize, although ambition is laudable, that I am so soon called upon to preside over a body of men, to whose talents and abilities and labors for the cause, in the last twenty-three years, is mainly due the present status of dentistry—a profession now recognized as embodying a science and an art, not alone in the United States of America, but in every enlightened nation of the world.

Some here present may question my assertion as to whether this Association is entitled to the proud distinction I have just given it, as there were other organizations in the field—not to mention the good work accomplished by our dental colleges, in providing a higher grade of education. But what other organization required the adoption of a Code of Ethics, and that delegates from local or State societies should hold the degree of doctor of dental surgery before they could be admitted to membership? None but the American Dental Association. This restrictive proviso in its constitution immediately placed it upon a higher plane than any of its competitors, upon the principle that to secure a status as a scientific body it was necessary to invite into its fold those only who had already secured that status as individuals. This body alone recog-

nized that every fountain must be pure, if the stream is to reflect from its pellucid bosom heaven's own purity.

Moreover, in the Transactions of this Association future generations may view the progress and history of dentistry throughout the civilized world, during the twenty-three years of its existence; and were its career, so fraught with usefulness and so pregnant with grand possibilities, now to end; were not another page to be added to its vast contributions to our well-beloved science; the record of what it has already accomplished, and the important role it has played in the arena of dental thought, would constitute a monument worthy of the hands that reared it, and which the remorseless tooth of time could never efface.

Every association,—in fact, every individual,—has a mission to perform. Our special mission is the alleviation of human suffering. What greater incentive could we have, beyond the sordid gain of filthy lucre, to stimulate the power within us to action? Surely, it is the grandest and noblest work in which the skill and talents of man can be enlisted, and is indeed godlike in its nature.

We are laborers in the field of human progress, and it is only through organized association that dental thought can be thoroughly disseminated and usefully applied. The advantages of personal interchange of thought evolved by discussions which arise in our assemblies are not attained by merely reading the journals in the seclusion of our offices. There is something in this friction of mind against mind which stimulates to action, engenders a high-toned emulation, practically induces investigation, and leads to higher development.

Much has been accomplished; yet we are only at the threshold of our science. Through our labors many new channels for thought and research have been opened, and if the flood sometimes has seemed to spread too far and lose itself in shallow or sandy places, it has nevertheless tended to fertilize them in the end. Then, with the animating knowledge of what our society has been, what it now is, and what our hopes desire it may be, let our watchword be "Onward and upward." And as the great chieftains and mighty intellects of ancient Rome by their abilities in the forum and their prowess upon the fields of war bequeathed to their fellow-citizens their highest and proudest distinction—*a citizen of Rome*—so, upon the peaceful plains of science and within the walks of our own specialty, with every energy and every heart enlisted under her banners, may similar honors be earned and distinguish "*a member of the American Dental Association.*"

SECTION VI.

PATHOLOGY, THERAPEUTICS, AND MATERIA MEDICA.

Syphilitic Teeth.

PAPER BY A. G. FRIEDRICHS.

THIS subject is one in which I have always taken an exceeding interest. From the time I began the study of my profession I have taken advantage of every opportunity to satisfy myself as to whether there were certain deformities that were characteristic and diagnostic of syphilis, recognizing, as I do, the importance and value of such aids in diagnosing the more obscure forms of this dreadful disease. I have read Mr. Hutchinson's address, but I must confess that the descriptions which he has given of what are the special deformities arising from syphilis are rather vague and of too general a character, and can be applied to a great variety of deformities associated with interstitial keratitis.

This question occasioned much discussion at the last meeting of the International Medical Congress. Dr. Magitot read an article at that meeting wherein he stated that the deformities ascribed by Hutchinson to syphilis could not be attributed solely to that cause. Mr. Nacati also has said as much, and in a very interesting work has shown that these deformities should rather be attributed to rachitis than to syphilis. In my own practice I have come across deformities in the teeth of children resembling the deformities described by Hutchinson, where there were no traces of syphilis. I have now three cases under observation where there is no history of syphilis; the teeth are of the same character as we find associated with interstitial keratitis. One of these cases has a general inflammation of the eye with loss of mobility, teeth with so-called syphilitic characteristics, but no taint of syphilis. Many more cases came under my observation while a student at the Charity Hospital, New Orleans,—some with syphilitic history, some without; and in both classes presenting quite a variety of deformities.

The diagnosis of syphilis, as you all know, requires at times the utmost skill, as its symptoms may counterfeit and combine the symptoms of various diseases; so that frequently we are only allowed the bare suspicion. Besides, the patient, when conscious, will often place every obstacle in the way to mislead us, willing to acknowledge any other of all the ills to which flesh is heir in preference to syphilis; and in many instances, too, patients, inheriting the disease, are themselves unconscious of their infection.

By the foregoing remarks I do not wish to convey the impression that syphilis does not occasion deformities; but to assert that these deformities are unmistakable or invariable evidences of congenital syphilis is, in my humble opinion, too absolute a statement. The experience of others, as well as my own, warrants the statement that as inherited syphilis is a disease affecting the nutritive processes, thereby interfering with the development, not of the teeth alone, but of the whole organism, it could of itself be a cause; but independent of it any other condition that would likewise arrest development—rachitis, etc., for instance,—would produce very similar results.

Mr. Hutchinson asserts that the only teeth to which he could venture to attach much importance are the upper central incisors of the permanent set. Now, as syphilis occasions an interference with the general development, it appears to me that, as this morbid condition antedates birth, the temporary teeth should present deformities as characteristic as those of the permanent set. Why, then, when all the other teeth, both temporary and permanent, are of similar formation and exposed to precisely the same influences during the whole period of their development, should only the upper central incisors of the permanent set present characteristic peculiarities?

I believe they result from the diseases of early infancy, which modify the nutrition of the dental germ. What is the disease? Is the disease diathetic, and does it give a peculiar shape to the malformations of the teeth? In my opinion, there is no special diathetic malady which produces a specific malformation of the permanent incisors. Any grave sickness in early infancy will produce this result. Neither syphilis, nor rachitis, nor chronic enteritis has any different influence. Hereditary syphilis and rachitis cause malformations of the teeth, not as syphilis or rachitis, but as a cachectic condition. It is as the result of a depraved nutrition, modifying the development of the dental germ, that syphilis produces the

alterations of the permanent incisors, and not as a diathetic disease. Consequently, this modification of the dental organisms is occasioned by all the cachectic maladies of infancy. Similar disturbances to those that occur in the dental germ, occur also in the nails, the hair and the bones. The nails become thin, then thicken, presenting the ridges attributed by Bean to dyspepsia, and which, with the return of health, disappear. The bones enlarge at the margins of the epiphyses, and rarefy, tending to osteoporosis. They soften, bend easily, and can not even support the weight of the child, so that it would rather lie abed, even after it has already begun to walk. The dental germs are subject to the general law and they become altered with the rest of the economy, whatever the cause which affects the general nutrition of the patient. They suffer when all suffer.

Buchat, after a minute and careful analysis of one hundred and fourteen cases of dental malformations, states that when observed in association with hereditary syphilis, the deformity was due less to the syphilitic impression than to the influence of a cachectic condition; also, that of the one hundred and fourteen cases only eight could be attributed to syphilis.

When we consider with what delicacy and care we must conduct the examination of a case where syphilis is suspected, because rashness may not only cause ill-feeling, but may blight the life of the sufferer, we can readily appreciate what difficulties beset a physician in his endeavor to reach a correct diagnosis; so that it is only in a few cases, where parents acknowledge their syphilis and that of their children, or where the physician has had the child under his observation and followed it from its infancy, that any but the merest hypotheses can be made. To regard as syphilitic teeth the teeth of children about whose early life nothing is known, or of children who were not syphilitic but whose fathers once had syphilis, or children whose ancestors were not known but were thought to have been syphilitic, upon the supposition that their parents may have been liable to acquire syphilis, may be very excellent to satisfy some pet theory, but I fear would rather be an obstacle to the progress of science. All hypotheses should be laid aside and facts alone should be brought forth—demonstrable facts. All that is doubtful should be purged from our records or set down in their proper place and called by their proper names,—suppositions, suspicions, assertions,—but not facts. Then will we all accept them with the proper reserve. I fear, with regard to syphilitic teeth, that there has been too much

speculation. The alterations of the teeth are neither more nor less, in my opinion, than the result of a cachectic state. Syphilitic, rachitic, scrofulous, intestinal, or pulmonary cachexiæ all interfere with the nutrition of the teeth, as well as of the skeleton in general; likewise, in very young children, a long and painful illness, an eruptive fever, associated with serious complications, or a chronic enteritis, will stop the development of the osseous tissue, causing softening of the bones, swelling of their extremities, rarefaction of their epiphyses, and alterations in the teeth.

Similar alterations in the osseous structures can be artificially produced upon birds by suppressing all the phosphates of lime from their food. The same result was obtained in a litter of pigs by premature alimentation and confinement in the dark.

Hereditary congenital syphilis or syphilis acquired shortly after birth can be the cause of dental deformities, but these deformities can also be occasioned by a grave illness; for instance, any chronic disease of the intestines, stomach, or lungs, that may occur in early life. It is this systemic depravity which causes this disturbance in the regularity of the movements of the bony nutrition. The specificity or the diathesis of the case is worth nothing. A disturbance of nutrition is the starting-point in all these alterations. Therefore, while the deformities claimed to be diagnostic of and peculiar to syphilis can result from syphilis, they can likewise be the result and more often *are* the result of a depraved or weakened physical condition.

SECTION VI.—Continued.

Treatment of Pyorrhea Alveolaris.

PAPER BY A. W. HARLAN, OF THE SECTION.

ON account of the uncertainty in the mind of the dental specialist with reference to the treatment of that variously named and illy defined disease, known as pyorrhea alveolaris, Riggs's disease, alveolitis, phagedena pericementii, etc., the writer desires to offer a few suggestions relating thereto, which may tend to give more confidence to those who have had but little success in their efforts to restore to health the tissues which are so often ravaged beyond repair. It will not be necessary in this report to say anything of the etiology of the disease under discussion, beyond the expression of the belief that it is infectious, and that micro-organisms are at least partially responible for the disastrous results which are sure to follow if it is not checked before the complete destruction of the alveoli.

It is now nearly two years since I became convinced that the methods of treatment advocated by various writers, including that of Dr. Riggs himself, were not the most beneficial to the majority of cases presenting themselves. At that time I was engaged in making some experiments with the essential oils and eucalyptus globulus, to determine their value as antiseptics. During these investigations it occurred to me that iodide of zinc, which then, as it does now, occupied only a few lines in the "Dispensatory" and works on medical chemistry and therapeutics, might be the remedy which would rob the hydra-headed monster of its terrors for the dental surgeon. I procured a sample and at once made solutions of xii. and xxiv. grs. to the ounce of water, and waited for the first case. It soon came. My first experience with it was in the fall of 1881, and the first case was that of a lower central incisor; the gum was loose two-thirds of the length of the root on the labial surface, pus exuding on pressure, and the alveolar process wasted half the length of the root; there was little, if any, deposit on the labial surface of the root, and no salivary calculus on any of

the teeth, except the buccal surfaces of the superior third molars. I carefully cleansed the root and excised the edge of the bone, then dried the pocket, after washing it out with water, and injected into it three drops of the first-named solution. The patient was directed not to squeeze the gum, but to return in four days, and let me see him. When he returned, I dried the gums and applied pressure, and found scarcely any discharge. I repeated the former treatment, omitting the scraping and probing, and when he returned the second time there was no discharge whatever. The pocket had commenced to fill up, and the gum was beginning to re-attach itself to the tooth. The patient returned again after eight days, and there remained hardly a trace of the disease. To all intents and purposes it was cured. After the lapse of more than twenty months the gum remains firm, and is of normal color, without depression or any external evidence of having been diseased at all. The remarkable manner in which this remedy exerted its beneficial influence in this case caused me to practically discard all other therapeutical agents in the treatment of pyorrhea, except as shall be hereafter mentioned. I found from a study of cases that when a patient was suffering from an acute attack of pyorrhea the pockets should first be packed with iodoform and eucalyptus, iodoform and oil of cinnamon, or be thoroughly syringed with a one to three-grain solution to the ounce of water, of chloride of alumina, which is a good disinfectant and astringent, and also an excellent bleacher for discolored, pulpless teeth; but the method of using it in such cases will be dwelt upon in the discussion on operative dentistry. This method of treating the pockets in acute cases relieves the patient of present suffering, and also reduces the swollen gums to their normal size. In three or four days the sanguinary deposits may be removed and the edges of the alveoli scraped or burred off. The pockets should then be syringed with peroxide of hydrogen, which will cleanse them perfectly, and at the same time bring into direct contact with the diseased pocket a germ-destroyer and antiseptic not less potent than any which can be named. After drying the gums, the pockets should be injected with the previously named solution of iodide of zinc, one, two, or three drops, or more, in each pocket. When the patient returns on the fourth day the gums must be dried carefully, and a fine cone of cotton or bibulous paper be moistened with peroxide of hydrogen and gently pressed into each pocket. If there should be any effervescence, it demonstrates the presence of pus, and each pocket must be again injected with the iodide of zinc solution. Peroxide of hydrogen, for

all clinical purposes, is a perfect detector of pus, even better than the microscope, because those not familiar with it can see with the naked eye the bubbling produced by H_2O_2 when brought into contact with pus.

In chronic cases, after the removal of the diseased bone surgically and the cleansing of the roots are effected, the pockets should be syringed with H_2O_2, to be followed by the injection of the xxiv. gr. solution of iodide of zinc in precisely the same manner as has been heretofore described. In very bad or almost hopeless cases, I use even a stronger solution, grs. xlviii. to the ounce; and when the gingival margins present a ragged border or cone-shaped slit, I apply the pure granular iodide to the edges of the slit once in three days, and soon find a perfect restoration of the normal festooning of the gingival margin. The injection into the pocket is to be repeated every fourth day. The length of time required for the cure of cases where two to four or five teeth are involved, varies from twelve days to four or five weeks, supposing the patient to be in ordinary good health. In those cases where constitutional treatment is required each must be met according to the indications, and the intelligent practitioner will decide for himself just what is needed during the period of local medication. The worst case that I have had during the past two years was where sixteen teeth were diseased, and it required constant care from March 26 to June 12, 1883. It was a case of three years' standing, and had been under the care of two gentlemen before it came to me, and the patient thought her gums were worse after leaving them than before treatment was commenced.

Iodide of zinc has long been used by medical practitioners, in the form of a syrup for internal administration, and as an ointment externally for strumous inflammation and enlargements, chorea, etc. It is made by digesting four parts of iodine with a little more than one part of granulated zinc and twenty parts of water, until the liquid has become colorless. On evaporation it crystallizes and is ready for use. It is freely soluble in water. I present herewith a comparative table of the relative value of antiseptics and germ-destroyers, which as all may see places iodine almost at the head of the list.

This table is the result of a large number of experiments by M. Miguel, of the Observatoire de Montsouris, and shows the minimum quantity of the several antiseptics capable of preventing the development of germs and of adult bacteria in a liter of bouillon:

	Gms.		Gms.
Peroxide of hydrogen	0.05	Arsenious acid	6.00
Bichloride of mercury	0.07	Sulphate of strychnine	7.00
Iodine	0.25	Boracic acid	7.50
Chloride of gold	0.25	Arsenite of soda	9.00
Bichloride of platinum	0.30	Hydrate of chloral	9.30
Cyanhydric acid	0.40	Salicylate of soda	10.00
Bromine	0.60	Caustic soda	18.00
Chloroform	1.00	Borate of soda	70.00
Bichromate of potassa	1.20	Chlorhydrate of morphine	75.00
Ammoniacal gas	1.40	Alcohol	95.00
Thymic acid	2.00	Iodide of potassium	150.00
Phenic (carbolic) acid	3.20	Marine salt	165.00
Permanganate of potassa	3.50	Glycerin	225.00
Acetate of lead	3.60	Sulphate of ammonia	250.00
Alum	4.50	Hyposulphite of soda	275.00
Bromo-hydrate of quinine	5.50		

Corrosive sublimate has the most powerful effect on bacteria; an aqueous solution of 1 in 20000 kills the spores of bacilli in ten minutes. A solution of 1-5000 is thus a certain disinfectant, even when the time of exposure is very short. Koch finds that an aqueous solution of corrosive sublimate of 1-300000 puts a stop to the germination of bacterial spores. Sulphurous acid does not rank high as a disinfectant. Bacteria clinging to dry objects are killed after twenty to thirty minutes exposure to an atmosphere containing 1 volume per cent. of sulphurous acid. Spores of bacillus subtilis and bacillus anthracis are still capable of development after 96 hours exposure to an atmosphere of 5 to 6 vols. per cent. of sulphurous acid; even when moist they are very hard to kill with it. It is thus a very untrustworthy disinfectant, all the more so because it has little power of penetrating compact masses or bundles,—(Wolfhügel, Buchholtz, Schotte and Gärtner, Koch, Buchner). Carbolic acid in five per cent. solution will kill the spores of the anthrax bacillus in twenty-four hours. A three per cent. solution, however, will not do so in the same time. A solution of 1-400 checks the development of bacterial spores. Vapor of carbolic acid at ordinary temperatures is without effect; at 55° C. it kills the spores in two or three hours (Koch). Chloride of zinc in five per cent. solution has no effect on anthrax spores, even when they have lain in it for a month (Koch). Iodine, bromine, and chlorine are far more active than sulphurous acid. Bacilli cease to grow in the presence of iodine in the proportion of 1-5000, and of bromine 1-1500. Iodine water and chlorine water kill spores in one day; a five per cent. solution of chloride of lime in ten

days. Benzoic acid, sodium benzoate, potassium chlorate, and quinine have little effect on spores. The following substances, even in dilute solution, have a restraining influence on bacterial development: allylic alcohol; oils of mustard, peppermint, turpentine, and cloves; thymol, chromic, picric, hydrochloric, and salicylic acids; quinine. The effect is perceptible in solutions of 1-300000 for oil of peppermint, of 1-800 for quinine, of 1-75000 for oil of turpentine. All disinfecting agents should be used in aqueous solution. In alcohol or oil they are either inactive or enfeebled. Bacillus spores still retain their power to germinate after lying for months in absolute alcohol. Pure oxygen is known to kill bacteria outright.—*Page* 75, 275-8, *Zeigler.*

This system of treatment, based on the primary injection of H_2O_2 into the pockets as a ready method of cleansing them and at the same time furnishing nascent oxygen to destroy the unclassified micro-organisms there present, and the subsequent injection of the zinc iodide, for its well-known stimulating and protective effects on the reparative material exuded, which is always ready for organization after being thus carefully protected, renders it almost certain that if careless probing or syringing of the pockets is prohibited, and the mouth is well cleansed with an antiseptic wash, a reproduction of lost tissues may be confidently anticipated.

In conclusion, permit me to say that this remedy, when used faithfully in conjunction with peroxide of hydrogen, the most valuable germ-destroyer known up to the present time, arms us so well that I believe with expert handling of the probe to discover the concealed pocket, skillful removal of all deposits and edges of diseased bone, conjoined to an exact knowledge of constitutional needs, that we no longer need feel dismayed when brought face to face with a genuine case of pyorrhea alveolaris.

DISCUSSION ON DR. FRIEDRICHS' PAPER.

Dr. ATKINSON: The discussion of this subject reaches to the foundation of the change of nutrient activity from health to a diseased form, and involves all the differences of the syphilists and the antisyphilists from the earliest time of pathological discussion.

It is very clear that the paper and nearly all the references in it are of the mass character that reach at presentments that are competent to be observed by the unassisted natural vision, from which we cannot explain any of the changes that take place, nor settle

the difference between the appearance of a tissue that is under what is here called cachexy or syphilis, forgetting entirely that there may be a syphilitic cachexy.

If you will look closely into some of the statements of the paper, you will see that they are gratuitous. It is said that the syphilitic virus holds its court in the embryo. If it holds its court in the embryo, this paper may be true when it says, "There is no distinctive characteristic in the temporary teeth."

I think the writer really comprehended what he said, but did not say what he meant,—that there was no syphilitic characteristic manifest so far as his observation had gone in the temporary teeth; but that there are characteristics in the temporary set is absolutely known, and by them we are enabled to distinguish the temporary from the permanent set, and if we wish to see these differences and discuss them, we at once go outside of the range of mass observation and must be acquainted with the histology of the tissues to be masters of the subject.

The entire mass view tells us at once that we are only beginning to comprehend what function is, for the very reason that because there is such a great variety of molecular changes that enter into the constitutions of different individuals the standard of health is not a unit. The standard of health is different for every individual and we can only generalize upon those questions if we deal with them in a mass way. Until we know the molecular changes whereby the food is converted into the tissues that constitute the organs of the body, we will simply be striking in the dark and unable to satisfy our own minds of the ratiocinative process through which we go in the examination of particular cases in order to arrive at what we call a diagnosis; and probably the greatest obstacle in the way of our proper advancement is, that we have not been willing to be rigid in scrutinizing our own mental processes, so as to know when we are satisfied with our examination and with the judgments that we pronounce, so that we could religiously say that we did know what we were about.

Dr. PEIRCE: The paper just read, it seems to me, has dealt with the facts as we have them presented to us by physicians and by the literature of the day. It is mass observation, it is true, but from mass observation we can learn a great deal.

It is well known to the dental profession that certain characteristic impressions prominent upon the permanent teeth are designated by the medical fraternity as syphilitic markings. This we have

heard affirmed from the time we entered the profession whenever these peculiar abnormal conditions were a subject of conversation with a member of the medical fraternity. From observation dentists have been taught that other conditions will produce these same appearances and therefore it is unjust to attribute them always to the one specific disease. For that reason I was rejoiced in listening to the paper. I felt that it had taken up the subject and presented it in an intelligent manner to this body.

Observing practitioners recognize the fact that a child who has suffered for the first six months of its life, or during the period of the eruption of the deciduous teeth, with what is termed interrupted dentition,—going through a series of convulsions with every tooth erupted,—must have the permanent teeth very badly developed. It may have markings on the permanent teeth to correspond with those that have been termed syphilitic.

If a child is placed in my chair with the permanent teeth erupted and pitted, I can say to the mother, "This child had some severe illness during such or such a period of its infancy." If the child was ill from birth all through the first year or especially from the fifth month up to the end of the first year, you will find the central incisors and the first permanent molars are imperfectly calcified, with lines or pits over the masticating surfaces of the molars and across the labial surfaces of the incisors. You will probably find the inferior incisors broad at the cutting edge and constricted towards the neck, and you will usually find the markings prominent which are laid down by Hutchinson as belonging to syphilitic teeth.

I have, I think I can safely say, twenty patients in my practice who have just those conditions of the teeth that Hutchinson portrays in his diagrams as being due to syphilitic taint, but I am satisfied that if there was any syphilitic influence in these cases, it dated back several generations. Whenever we have an abnormal condition during the calcification of the permanent teeth that is sufficient to interfere with nutrition, we have the permanent teeth deficient in the quality and quantity of enamel and dentine. This is all, as Dr. Atkinson has said, mass observation. If we go closer to the histology of the teeth we shall find imperfect calcification throughout the whole tooth, provided mal-nutrition lasted during that period.

If a child has had no ill health until the end of the first or some time during the second year, and then is attacked with scarlet fever and is ill for six weeks, you will find the permanent incisors and

first molars perfect for some distance from the cutting edge or grinding surface towards the gum, and then you will find a row of pits around the teeth, while below these again the teeth will be perfect quite to the neck or gum, showing that nutrition was normal up to the period of the attack of scarlet fever, abnormal during the continuance of the disease, and again normal after that until the completion of the crowns.

Wherever you find mal-nutrition, whether from scarlet fever, measles, whooping-cough, or any other condition, there you will find that handwriting on the teeth.

If no interruption to nutrition occurs until after the crowns of the incisors are fully calcified, but does take place while the second permanent molars are in process of calcification, then the same markings will be found on these latter teeth, indicating the condition of health of the child during that time.

If any one is observing and notes the correspondence between health and development, by a little inquiry he will soon learn to say to the mother, "This child was sick during certain months or certain years of his or her age." I can bring to mind now a child which came to me with the second permanent molar defective, and I said to the mother that the child at the age of four years suffered some systemic disturbance. She said, "Yes, he had scarlet fever at four years and was very ill for months." There the second permanent molar was badly marked; so I say, by a close observation we arrive at a knowledge which enables us to designate within a few months the age at which the child suffered from ill health sufficient to interfere with calcification of the tooth-structure.

Dr. ATKINSON: Dr. Peirce rather gives the go-by to the idea that we must understand the minute elements of an organ to comprehend whether it is in a healthy or diseased condition. He has completely confirmed what I wish to say. Being acquainted with the law of the evolution of the teeth enables us to say that at such a number of months, in a general way, the child had some sort of skin disease. This is simply the knowledge of the mischief, but not of the seat of the mischief. I only desire to stimulate the young men to study minutely embryology and histology, so that they can get at the comprehension of these things. I have seen as fine structures of teeth as I have ever known, with this exception,—marked with these lines across them,—where the cause was simply interruption of the process of the deposit of lime-salts that formed the enamel and the dentine, at the time they were in a soft condition. I simply wanted to

make this point in advocacy of getting at bed-rock,—the foundation principle for which this body was established,—that we might be able to scientifically justify our procedure with the cases that come before us.

Dr. PEIRCE: There is no difference in sentiment between Dr. Atkinson and myself, excepting that I felt that he did not appreciate the object of the essayist, which was simply, as I understood the paper, to correct an erroneous impression in the profession. The writer did not attempt to go into histology at all.

I fully agree with Dr. Atkinson that we are coming to be better instructed, by getting deeper down, or nearer to the beginning of things. Yet the paper was written to correct a superficial impression, and I think it has done it very admirably; at least, it has brought the subject up in a very intelligent manner before this body.

Dr. DARBY: I have been much interested in the paper just read. It seems to me that the value of the paper lies in the fact that it endeavors to correct a general but erroneous impression. The impression is too general that the deformed teeth which we frequently meet are the so-called Hutchinson's syphilitic teeth. Physicians often ascribe a syphilitic origin to teeth the deformities of which are not due to such taint, and dentists make the same blunder. Some years ago a physician of prominence came to my office with a child, accompanied also by its mother. He called me into another room, and said to me that I should be careful in questioning the mother about the character of the child's teeth, for he thought them to be syphilitic teeth. I had known both father and mother for years, and believed them both entirely free from anything of the kind. The teeth were simply malformed; the sixth-year molars and incisors were alike defective in development, showing that at the time of their calcification there had been imperfect nutrition. The physician had evidently been tracing back the ancestry of the child, hoping to find syphilis in one or both sides of the family.

I am very glad that Dr. Friedrichs directed special attention to and emphasized the difficulty of correct diagnosis and the mistakes that are so frequently made by medical men and even by dentists. We are entering a delicate sphere when we question parents upon the supposition that their children's teeth bear marks of syphilis inherited from them. In my opinion, we rarely meet with syphilitic teeth in our practice.

One of our prominent Philadelphia dermatologists has been work-

ing up this matter of late, and by the aid of my assistant has obtained plaster models of many cases from among the poorer classes. He has been exceedingly careful to take none except such as he is sure proceed from syphilitic parentage. The value of his investigation lies in the fact that the evidence is indubitable.

Dr. KINGSLEY: What is the appearance of the teeth in those cases which are undoubtedly congenitally syphilitic? Is there any peculiarity of the teeth in those cases?

Dr. DARBY: I cannot say they are materially different from many of the malformed teeth that are frequently met with in practice, except that the teeth are more stunted in development. Instead of having the notched or serrated edges which are so frequently seen in cases of interrupted nutrition, they have a more stunted and undeveloped appearance throughout.

Dr. KINGSLEY: It has been my fortune during the last twenty-five years to have seen a great many cases of the children of those who were undoubtedly syphilitic. But in no single instance have I seen any markings upon the permanent teeth, such as have been described as syphilitic markings. There has been no peculiarity in those teeth in any cases that I have seen, whereby I could pronounce positively that the patient was congenitally syphilitic.

I have long since ceased to place any faith in the idea that the markings which we so often hear called syphilitic markings, by the medical profession, are due to syphilis in any case.

Dr. ABBOTT: I have for fifteen years looked almost in vain for cases of what would seem to me examples of syphilitic teeth. The kind of teeth which Dr. Peirce has described, of which we see so many, are far from them, in my estimation.

Some two years ago I discovered a case in a child about ten or eleven years of age. The teeth were exactly what Mr. Hutchinson describes. At the points of the central incisors they were a sixteenth of an inch narrower than towards their necks; instead of growing broader they became narrower toward the cutting edge. That is one of the special peculiarities of syphilitic teeth, and not this pitting that is observed in so many cases, which is due to a want of nutrition and a cessation of the formation of enamel at a certain time during the process of calcification.

Dr. BARRETT: Whether or not certain marks are indelibly impressed upon the teeth of children born of syphilitic parents is an unsettled question. I have paid some attention to the subject, and have watched as carefully as possible to see whether I could detect

the traces that have been charged upon syphilis. In one family that fell under my observation, and whose physician informed me of the condition of affairs, the older children, who were born previous to a syphilitic infection, had teeth that were regular and comparatively sound, but those born since that epoch have teeth which are very irregular and malformed in shape, the substance of the tooth-bone very soft, and the whole denture very liable to decay and disease. This does not necessarily prove that syphilitic infection caused the latter condition, because the peculiar shape of the so-called Hutchinson's teeth is not present. If there be any marks they are of a different character.

I have seen other cases and am satisfied that if they are from syphilitic infection, if such infection does affect the shape, consistence, color, or contour of the teeth in any way, the changes so caused are not at all uniform. So far as my own observations extend there is no such thing as a true syphilitic type of teeth. That syphilis may leave its impress upon the teeth is quite probable, but I do not believe it has as much effect upon them as many cases of eruptive fevers occurring during the various stages of their calcification.

This summer it has been my fortune to make a study of a large number of skulls of pre-historic American races. I looked especially for syphilitic marks. It is a disputed question whether syphilis was present in the pre-historic races of the Old World before the advent of modern civilization. It is also disputed whether or not syphilis was present previous to contact with the whites upon this continent, but I believe the preponderance of testimony is that it did not exist. In all the skulls that I examined there was but one which showed the least trace of syphilitic affection, and in that there was good reason to suppose it was an intrusion, and had found its way into the burial-place of the pre-historic people at a later day.

DISCUSSION ON DR. HARLAN'S PAPER.

Dr. BÖDECKER: I have for several years been very earnestly investigating this disease, but have come to a different conclusion than that formed by the essayist. It is as yet an unsettled question that bacteria are the source of inflammation. I am of the opinion that bacteria are rather the result of an inflammatory process and not the cause. Bacteria derived from other sources of inflammation are exactly the same as those derived from pyorrhea alveolaris; at least they appear to me to be exactly the same.

I do not believe that the theory that the germs are directly the cause of an inflammatory process can be maintained, but, on the other hand, wherever these germs are allowed to grow, inflammation will prosper. There is no doubt about that, and therefore antiseptics in pyorrhea alveolaris are of the greatest service; but they should be antiseptics of a non-irritating character. We have antiseptics, such as chlorine, iodine, and bromine, that are exceedingly irritating to the tissue, and by excessive use secondary inflammation is often induced, or the primary prolonged.

In the treatment of pyorrhea alveolaris, if we first use iodide of zinc, which I have been using for a number of years, it is exceedingly valuable, but if continued too long, in some cases it may keep up the inflammatory process, and will not lead to a cure so quickly as some other agents which are of later discovery. For the last eighteen months I have been using a saturate solution of tartrate of chinoline. This preparation is obtained from coal-tar and is exceedingly astringent, non-irritant, and a very admirable antiseptic. I have obtained results with this salt that are simply marvellous. I have seen teeth which were so loose that I could have removed them with my fingers, which by the use of this remedy were within four or five weeks rendered perfectly tight in their sockets. I exhibited one of these cases at the clinic of the New York First District Dental Society two months ago. Another remedy is a solution of boro-glycerole, which has given me a great deal of satisfaction, and I believe it is in certain cases exceedingly valuable. But the tartrate of chinoline I would recommend as the best astringent remedy in this disease.

The treatment which I have generally pursued is, in the first place, to remove all calcareous deposits which are within easy reach without lacerating the gum; I then take a very thin but stiff steel instrument, around which I wind a piece of cotton rather tightly, dip it into the iodide of zinc and rub round the neck of the tooth thoroughly, so as to wipe away all foreign matter that is loose.

In this way I make two or three applications with iodide of zinc, and then begin with the saturated solution of tartrate of chinoline. I use it in the same manner, with cotton wound around a thin instrument, wiping away every trace of foreign matter under the gum.

Dr. DARBY: I would like to say one word about one of the remedies Dr. Harlan has mentioned in his paper—that is, iodoform. He has spoken of it as an antiseptic. It is both antiseptic and anæs-

thetic, and is one of the best remedies we have for toothache. It has one serious objection, however, and that is its odor. When that objection to it is removed, it will occupy a very prominent place in our list of remedies.

A gentleman who tells me he has had very large experience in the treatment of pyorrhea alveolaris says he has been in the habit of using pulverized nitre. He inserts it between the gum and the tooth, and allows it to dissolve there. I have never used it, but simply give you the testimony of one who says he has had great success with it.

Dr. ABBOTT: The best remedy I have ever found in this disease is a very carefully handled, properly adapted instrument. I have never yet found anything that will replace real hygienic operations—that is, operations which will secure a proper cleansing of the roots of teeth of the irritating substances that collect upon them. No remedy will ever take its place. If these are *removed*, I will guarantee that in nine cases out of ten the disease will disappear without any antiseptics, disinfectants, astringents, or anything called medicine; and unless this be done all the remedies known to the medical profession will not effect a cure.

Dr. I. P. WILSON: Did I understand Dr. Harlan to say that he succeeded in perfect restoration of the lost tissues of the alveolar process and of the gum, and that they firmly united with the teeth again?

Dr. HARLAN: I said the restoration of lost tisse was almost certain to follow this careful, persistent, systematic treatment. If there is cure there is restoration.

Dr. ATKINSON: I observe that there is always a disposition to push to the ultimate every question and there is a shyness on the part of those who reply to meet the demand. The last question brought me to my feet. Are the hard structures reproduced? That brings out a principle of nutrient activity in production and maintenance of tissue, which, if understood, would answer all these questions satisfactorily.

The aphorism is this: reproduction follows the same order of activity as original production of the tissues of the body. I will show any doubting man reproduced alveolar process, and if he were not aware that he was examining for reproduction he would not be able to distinguish between the parts that were original and those that were of the reproduced material.

Cleanliness is akin to godliness and godliness is obedience to law,

and obedience to law must be spontaneous obedience. If we could get at such a condition as would fulfill all the functional requirements of the body there would be no deterioration anywhere.

It would be more profitable to ask questions and get direct answers than to have long preachments on this and that. Statistics are well enough if they are faithfully made. I do not care how faithfully they are made, however, if there is not intelligence enough in the observer to interpret them, they are but worthless ceremonies and dead weights upon you; they are darkness and not light. How many men here could answer the question—What is inflammation? I have never been in a medical convention where there was one who could answer it except by repeating some old red-letter definition. Redness, heat, swelling, pain; that is all you could get out of them and they ring the changes on those. We can have any one of them and not inflammation, and we can have inflammation without one of them at all events,—redness. I have never seen epithelium reproduced. I have never seen muscle reproduced. I will ask any histologist if he has. One histologist that I love dearly says he has. I have seen nerve and bone reproduced so that the finest microscope could not detect the difference.

Dr. ABBOTT: I am sorry our friend did not go on in the direction he was going and follow back the changes in the tissue from its normal state into the condition of inflammation again. That is a very interesting process. Around the root of the tooth there is an inflammatory condition going on, brought about by some irritating substance that is located upon or around its root. What does that inflammatory condition consist of? Before a protoplasmic, or rather a bioplasmic mass is converted into any special tissue, it consists of an indifferent or embryonal mass. Nature makes out of this mass the different varieties of tissues required. When inflammation of a part is produced, it is the reconversion of the tissues of that part to their indifferent or embryonal condition, and as the inflammation subsides, the proper tissues are again formed.

Dr. DABOLL: I think we do not make a sufficient distinction in the different expressions of this disease. In this disease we have various forms of expression. It may be the same disease all the way through, but we observe constantly differing conditions.

In the last ten years I have had more or less experience in the treatment of this disease but have never been able to reproduce the gum or the alveolar tissue where there has been absorption and a recession of the gum. In cases where there was an exudation of

pus and a loosening of the teeth, where pockets were formed by the side of the root, and there was no recession of the gum, I have been able to restore the tooth to its normal condition, with restoration of the alveolar process, because we had the condition to admit of it. I do not think there is any question but that we can restore the alveolar process where we have enough of the periosteum left. I have been very much interested in the discussion of the papers and hope that we have got some new remedies which may help us in the treatment of this disease, which has come to be a very common one for dentists to deal with.

Dr. PEIRCE: I want to congratulate this Association on an evidence of progress. We have discussed this paper, and Riggs's name has not been mentioned. A few weeks ago a lady came to my office in quite an excited condition. She said she had been spending three weeks in New York, and had occasion to call upon a dentist there who told her she had Riggs's disease. She asked me where she had got it. She said, "I have not seen Riggs, and I don't know where I could have gotten the disease."

SECTION V.

ANATOMY, HISTOLOGY, AND MICROSCOPY.

Action of Arsenious Acid upon Dentinal and Pulp Tissue.

PAPER BY C. F. W. BÖDECKER, OF THE SECTION.

THE action of arsenious acid upon the dental tissues has for a long time been a disputed question, and the changes effected by the poison when applied to the cavity of a tooth were thought to be confined to the pulp-tissue; although Dr. Clowes, of New York City, showed, several years ago, that an application of arsenious acid to the dentine of a tooth far from the pulp, would lead to the same result as if the agent was placed directly upon the organ, the only difference being that its action in the former instance was not so rapid.

In 1879, Dr. A. Witzel, of Germany, published an extensive work on the diseases of the dental pulp. In this he claims that a pulp, if not too much inflamed, can be treated with arsenious acid, its coronal portion amputated, and the remaining pulp-stump preserved. This doctrine has created a great deal of controversy in this country, although in Germany it seems to have been almost universally accepted. I have followed this line of treatment in sixteen cases, in an experimental way, selecting teeth which I was able to examine from time to time. I should not have used this method in so many cases, had not the first experiment misled me in such a manner that at the present time I am unable to explain it.

The case was as follows: in November, 1879, a healthy young lady, over eleven years of age, presented herself for the correction of an irregularity. The front teeth of both the upper and lower jaws were overlapping each other, and although the arches were pretty well developed there was not room enough for thirty-two teeth. I therefore decided to remove the sixth-year molars as soon as the second molars began to make their appearance. Three of the sixth-year molars were well preserved, but the left lower one was largely

decayed, and gave the patient trouble whenever anything sweet or sour entered the cavity; but the pain ceased as soon as the irritant was removed. Pressure in the vicinity of the pulp-chamber produced no pain. All these were signs that the pulp was in a tolerably healthy condition and admirably adapted to an experiment with arsenious acid in the manner described by Witzel. The details of the operation, concisely stated, are as follows: After the cavity has been cleaned of decay, the pulp is exposed and an application of

℞.—Acid. carbolic., 1.50 gms.
Tinct. aconiti rad., } āā, 0.50 gms.
Aquæ menth. pip., }
Glycerinæ, 0.20 gms.
Acid. tannic., 0.30 gms.
Ol. menth. pip.,
Ol. caryophylli, āā, gtt. xxv.—M.

is made for about five minutes, the arsenious acid paste is laid directly upon the pulp, and the cavity is hermetically sealed. After twenty-four hours the temporary plug is removed, a sharp, new bur which has been disinfected is put into the engine, and with a few quick revolutions of the bur the coronal portion of the pulp is amputated. The pulp-chamber is then syringed with a five per cent. solution of carbolic acid in water until the bleeding has ceased, when the cavity is dried, the pulp-stumps touched with the carbolic acid and tannin solution mentioned above, then with a carbolized solution of mastic, and still after this with a pulp varnish composed of collodion, gutta-percha, and a little carbolic acid. The pulp-stumps are then capped with carbolic acid cement, the formula of which is as follows:

℞.—Acid. carbolic., 0.50 gms.
Alcohol. absolut., 0.20 gms.
Aquæ destillatæ, 4.00 gms.
Glycerinæ, 2.00 gms.—M.

To this add an equal volume of the zinc chloride used in oxychloride fillings; and to a sufficient quantity of this mixture add oxide of zinc, and mix to the consistence of thick cream.

Six months after the operation I saw the patient and removed the four teeth mentioned above. On opening the roots of the left lower molar, to my surprise, I found the amputated pulp-stumps alive. Without delay they were prepared for the microscope and examined. The nerve-fibres of both these specimens showed nothing abnormal;

the connective-tissue of the pulp had retained its myxomatous character, and no sign of a former inflammatory process was observable, except where the pulp had been cut in the amputation.

This result induced me to try the same procedure in fifteen other cases, although microscopical examination of pulps treated with arsenious acid and extirpated with the broach had given evidence of the destruction of the medullated nerve-fibres as far down as the apical portion of the pulp. These pulps, however, without exception, had been removed on account of pulpitis, and I was, therefore, unable to determine whether the degeneration of the nerve-fibres was the result of the application of arsenious acid, or of a preceding inflammatory process.

The results obtained from the other experiments I made with Witzel's method of amputation, were, however, not so encouraging as in the case mentioned above. I have seen eleven of the remaining fifteen cases experimented upon since last October, but the pulp-stumps in every one of them had died, although the external appearance of the teeth was perfect.

The above-mentioned facts make it evident, therefore, that the minute microscopical examination of the changes effected by arsenious acid is to us of the greatest importance. They can best be studied in healthy or superficially decayed teeth of human subjects, or in the teeth of such animals as can be easily experimented upon. In all cases, therefore, a mode of procedure must be chosen, and the line of study is necessarily experimental, and should extend over a long period of time, calling for no inconsiderable amount of labor and painstaking care. Let this, therefore, be my excuse for communicating only a portion of the results obtained, which I shall take care to enlarge and detail at the earliest possible time. From my opening remarks and your own experience, you will know how important, practically, is any knowledge upon this subject. I have no hesitation, therefore, in laying before you this fragmentary communication.

The arsenious acid preparation which I have used exclusively is the well-known one composed of one part of arsenious acid and one part of sulphate of morphia, made into a paste with chemically pure carbolic acid, which was put into a drill-hole in the tooth and covered with a temporary stopping, such as cotton saturated with sandarac varnish, etc. I will not enter into details, but will only mention that, bearing in mind the results I wished to obtain, I drilled in the direction of the pulp-chamber, but did not in any case perforate it. It appeared to be quite immaterial, however, how thick

was the interposing dentine in respect to the changes caused by the poison.

I used human teeth and those of rabbits. They were extracted in from three to six days after the arsenious acid was applied. The teeth were opened immediately after extraction and immersed without delay in the proper reagent. It is very important to proceed in such manner that the pulp shall not be torn or dislodged, and yet may be acted upon by the fluids while still lodged in its natural position. When the elements of the pulp are once sufficiently fixed then only is it possible to cut (or tease) it without causing a great number of artificial changes. This is the first rule, I may say, which must be strictly adhered to by the student of so delicate an object as is the pulp. This is no easy matter, for unluckily the hardening fluids most generally in use themselves cause considerable changes; even water, and as has been found, the tissue-fluid itself, if allowed to act a sufficient time after death, gives to the medullated nerve-fibres an appearance which I have no doubt has frequently been described as pathological. Should I enter here upon the difficult task of describing the action of reagents, I would take up too much of your valuable time, and I am sure, furthermore, that I would tell many of you what you have known before. I will, therefore, say that after having used different other reagents, I have come to the conclusion that the very best results can be obtained by immersing the tooth in the manner described in a one per cent. solution of hyperosmic acid for from ten to twenty hours, according to the density of the tooth. As regards the pulp, this will be found to be sufficiently hardened after a sojourn of two to three hours in the same fluid; it can then be easily removed from the pulp-chamber without fear of serious harm. Both parts are then placed in distilled water and preserved in alcohol. I have, however, invariably examined the pulp, teasing it with great care, as soon as washed, after sufficient hardening in hyperosmic acid. The changes here are truly remarkable. Firstly, if the poison has acted sufficiently long, the whole of the pulp shows to the naked eye, as soon as exposed, all the signs of active inflammation.

I shall not enter into details of the appearance which such pulps present, but shall confine myself to a description of the alterations found in the medullated nerve-fibres. According to the degrees of inflammation resultant from the irritation which the arsenious acid undoubtedly does produce, a greater or less number of nerve-fibres are changed in appearance in such manner that their myelin is sepa-

rated into larger and smaller masses, between which I have not been able as yet to distinguish either an axis cylinder or an intermediate substance. I may, however, mention that I have seen in nerve-fibres which have remained under the influence of the arsenious acid for six days a granular substance which can be colored by rose aniline. When the poison has acted for the last-mentioned period all vestiges of myelin have disappeared and in their stead are found smaller and larger globules, which are stained a deep black by hyperosmic acid. I will not venture to advance an opinion as to the nature of these bodies. Thus much, I dare say, however: they are certainly a product of the disintegration of the myeline sheath. I have no doubt that this is a stage in the complete destruction of the nerve-fibres, and I may mention in this connection that, in one instance, I have found similar globules free in tissue surrounding a number of degenerated nerve-fibres in an incisor of a rabbit after three days' reaction of the arsenious acid.

You will no doubt agree with me that even this is far from complete, but you will at the same time be forcibly reminded of similar results found by many histologists after section of peripheral nerves in other parts of the body.

What will be the result of the arsenic so applied, not alone to the pulp itself, but as regards the nutrition and life of the whole tooth, is easily surmised, and can be demonstrated clearly by an examination of the dentine.

After having treated the newly extracted tooth with hyperosmic acid, and thereby guarded against artificial changes, I prepared ground specimens of the same. These were then stained with picro-carmine and suitably treated for mounting in Canada balsam. I purposely abstained from decalcifying these specimens, for, unless this process is watched with great care, the result in most cases will be, to say the least, very problematical. I have found that for the closer study of the dentinal canaliculi and their contents—the Tomes fibres—all decalcifying agents are out of place.

A superficial view of such specimens shows that hyperosmic acid has been reduced in certain places, whereas others appear colorless. Let me say at once that the former are regions of pathological changes. They start either directly from the place of contact with the arsenious acid, and extend varying distances into the dentine, according to the time of the reaction; or, as is evident where they can be traced as far as the pulp, they radiate apparently from the latter and extend toward the periphery. Viewed under the

microscope the dentinal canaliculi are very much enlarged, more so at one place than at another, and they appear to be filled with a mass deeply stained in black. The same can be said of the transverse connections of the canaliculi. When, however, high powers (one-tenth of an inch immersion of Grunow, N. Y.) are brought to bear on such places, the black mass is found to be composed of irregularly-shaped bodies, which I doubt not are remnants of the dentinal fibre. For, in following up such canaliculi, it can be distinctly seen that the greatly swollen dentine-fibres are broken up more and more as one approaches the seat of the greatest destruction. As a consequence, the basis-substance is very much narrowed in extent as the canaliculi gain in diameter. Moreover, it appears that the lime-salts are dissolved. I incline to this view because of the peculiarity of coloring, a matter into which I deem it advisable not to enter more fully just at present. I may add that, in such places, when the canaliculi are in transverse view, all these conclusions are fully borne out.

So far do I feel justified in entering upon this important subject to-day, although there are many points which I have thought best to lay over or only to touch upon. I am well aware, and should be prepared to hear, that the microscopical changes in the dentine are similar to those found in dental caries. It is well that in dental pathology, as well as in general pathology, due reference should always be made to the clinical aspect of the disease, and it is not less than presumption to classify together pathological units, with our present methods of investigation, enormous as has been the progress in this direction of late years. I am, therefore, far from identifying the changes here under consideration with those found in dental caries.

I am also aware that in very many cases, apparently, the effect of arsenious acid has not been so bad as might be expected, but on the other hand, you may all remember severe cases of local or even constitutional disturbances which could not be traced to any other cause than a dead tooth which had been treated with arsenious acid. Be this as it may, the question is certainly in order, whether, in view of the serious consequences, we are any longer justified in destroying pulps by the use of arsenious acid, and the answer must be that the risk is too great for the gain.

DISCUSSIONS.

Dr. PEIRCE: I have been much interested in the specimens of Dr. Bödecker and his explanation of them, but it seems to me that it is

unsafe to state that the arsenic has produced certain results when we are not sure what results would have taken place by devitalization from other causes. We are all aware that tissue does not remain quiet a moment. The instant there is devitalization changes take place, and therefore when we assert that these changes are due to the presence of arsenic we need, it seems to me, to know what would have been the appearance had devitalization occurred without the presence of arsenic.

Dr. BÖDECKER: I can only say that after three days' reaction of arsenious acid through a comparatively thick column of dentinal tissue, the inflammatory reaction which you have seen under the microscope was brought about. I do not think that any local irritation of the dentine could possibly have produced it; at least I have never seen it. I have seen hundreds of pulp-specimens which had been under the effects of irritation from caries, but in these cases I have never seen anything like this. The whole pulp-tissue is affected by the use of arsenious acid.

Dr. HORTON: I would like to know what tooth that was, whether a molar, bicuspid, superior or inferior, and the age and sex of the patient?

Dr. BÖDECKER: This particular specimen, I believe, was from the mouth of a young lady about twelve or thirteen years of age, and the tooth was a first lower molar.

Dr. WATKINS: I would like to ask Dr. Bödecker how much arsenic he puts into that pocket?

Dr. BÖDECKER: It does not make any difference how little of the arsenious acid is applied. I put in just as little as was possible, but always obtained the same reaction.

Dr. WATKINS: How long would you leave it there before removing it?

Dr. BÖDECKER: I have stated this in my paper,—from three to six days.

Dr. WATKINS: If you leave it in longer than three days there is great danger?

Dr. BÖDECKER: Of course, the longer the arsenious acid is left in contact with the tissues, the greater the danger.

Dr. ALLPORT: I would like to ask Dr. Bödecker whether he regards this change in the pulp as due to the presence of arsenic transmitted through the tubuli to this tissue, or to a transmitted pathological condition from the dentinal fibres, consequent upon irritation of their extremities from the presence of arsenic at that point.

Dr. BÖDECKER: This I shall have to find out later on. As I said, I have not had very much time to experiment. To determine this requires a great many experiments.

Dr. ALLPORT: The idea that arsenic will destroy a tooth-pulp by being placed in contact with the dentine is old. We know that thousands of pulps have been destroyed by applying arsenious acid in cavities of decay for the purpose of destroying the sensibility of the dentine. Because teeth so treated lost their vitality, the practice was long since abandoned by all intelligent practitioners.

Dr. ABBOTT: I have examined these specimens of Dr. Bödecker's, and from what I can see I should judge that the conditions produced were very much the same as those produced by any other irritating substance. In other words, if a tooth were decayed, and a section of it properly mounted, we would have the same result that we have seen under the microscope as produced by the arsenic. The fact of its working its way through so rapidly to the end of the pulp is simply due to the intensity of the irritation, causing the contents of the canaliculi to become swollen and broken up into the granular mass we see. Dr. Bödecker has explained that in many instances they have broken into spherical forms. This is the same condition that I described in 1879 as being found in deep-seated caries. The appearance under the microscope is the same. I think if the pulp were to die or was inflamed from any other cause, the same conditions would be observable that are here presented; *i. e.*, the conversion of the pulp and the contents of the canaliculi into an embryonal or elementary condition.

Dr. TAFT: Dr. Bödecker refers in his paper to the enlargement of the dentinal fibrils. I would ask how this enlargement is accomplished. Is there a removal of the interstitial material or is it pressed aside? If there is a removal, a solution must first be effected; if that is the case, how is it accomplished? How is provision made for this enlargement of the material of the tubuli?

Dr. BÖDECKER: I stated in my paper that I recognized in the action of arsenious acid upon the Tomes fibres a similarity to the action of caries, but the changes produced by arsenic are very much more rapid. I do not want to be understood to say that the action of arsenious acid and that of caries are identical. I also stated that I cannot say any more about these changes at present. I intend to further investigate the action of arsenic so far as lies in my power to do. I furthermore stated that when these Tomes fibres swell and disintegrate the basis-substance of the dentine is absorbed.

Dr. TAFT: This is a very interesting subject for those who are in the habit of using this agent in the treatment of the teeth, or even in the destruction of pulps, but especially in the treatment of sensitive dentine. I have not for many years used this agent. There are several things that should be remembered by those who use it. One is the varying susceptibility in different persons to its influence. Teeth of different densities will of course be affected differently, so far as the time required to produce a given effect is concerned. There seems to be, in many instances, even where the teeth are apparently equally dense and about alike as to perfection of structure, quite a difference of susceptibility to the influence of arsenious acid.

In some cases, when this agent is applied to sensitive dentine, it acts upon or through a thin lamina or stratum of dentine only; in other instances it penetrates much deeper, and in some instances destroys the pulp in a short time, even when applied in a very shallow cavity of decay. The age of the patient should always be taken into account. Other things being equal, the older the patient the more resistance will the tooth give to this agent. Many years ago I applied it to the teeth of a young person and the pulps were destroyed within twenty-four hours. I remember a case, thirty years ago, in which I used arsenious acid in a small cavity in a central incisor of a girl about fourteen years of age. It was applied about three or four o'clock in the afternoon, and the next day at twelve o'clock that tooth was purple, and a very high degree of inflammation occurred in the parts around it. This was a very well-defined case, and one in which the action occurred very promptly; but I have seen others very similar to it, and have seen the teeth of persons twenty-five years of age destroyed within twenty-four hours after the application of arsenious acid for obtunding sensitive dentine in a small cavity of decay. I remember another case, years ago, in which I applied it in a very small cavity of a lateral incisor. Within a day or two the pulp of the tooth was dead and inflammation set up, an abscess was formed in spite of everything I then could do, and the tooth was wholly detached and came away from its socket. I remember another instance in which similar treatment of a tooth by a neighboring dentist resulted in the same way.

I refer to these cases simply because if we are to use this agent, exceeding care should be exercised in its application to the teeth of young persons, and in older persons as well, even in teeth of the better kinds.

Dr. BÖDECKER: Dr. Taft mentions that the action of arsenious

acid varies very much with the density of the teeth. In the human subject I have not been able to experiment, except upon children up to about twelve or thirteen years of age; but on the other hand I have experimented upon a very old rabbit. I took three of his incisor teeth, one upper and two lower ones, which I found to be as hard as any human tooth I have ever ground. They were just like steel, but the changes produced in the rabbit's teeth were just as distinct and of the same character as those found in the human teeth.

Dr. BUCKINGHAM: Some experiments that I have made have led me to believe that arsenic when taken in is absorbed and not changed. It acts by its presence,—not by devitalization of the tissue, but in some way that we do not understand, and a preparation of arsenic that has effected these results is still at liberty to act upon other tissue.

I was experimenting some years ago with arsenic, to see whether it would be absorbed, by placing it in one of the legs of a frog and allowing it to go through. I found arsenic in every part of the frog. I suppose it went there by circulation in some way, or by absorption. I then wanted to know whether it was combined with the tissue, whether there was any decomposition of the arsenic itself, and I took an egg and mixed a certain portion of arsenic with it and boiled it so as to coagulate the albumen and make it a solid mass. I then placed it in a funnel and poured water on it, passing it through probably a half dozen or a dozen times, and then I tested for the arsenic in the egg, and there was not the slightest trace of it, showing that the arsenic had acted by its presence upon the tissue, and had been washed out by this dialyzation, as we call it.

When we apply arsenic to the pulp of a tooth, a certain portion becomes dissolved, and that follows down through the tissue of the pulp, destroying it by its presence; it does not act as a caustic at all, because it has the quality of preserving tissue.

Dr. E. PARMLY BROWN: If these demonstrations that Dr. Bödecker has made will prove to us that we are doing wrong in using arsenic I desire to find it out. When gentlemen write articles in journals and tell us not to use arsenic, and they do not tell us why, I want to know the reason. If I know anything, I can convince everyone why I know it. Because a young, inexperienced surgeon has killed some poor fellow with the knife, is that any reason why knives should be abandoned in surgical operations? And because Dr. Taft or any other dentist, years ago, did not know how to use arsenic, is

that any reason why I should abandon arsenic? With two exceptions, I know of no instance in my practice where it has not relieved my patients from the most infernal torment. I know of no instance where a filling has failed because arsenic has been used, nor have I read or heard of anything that has led me to believe that arsenic used intelligently is anything but a mercy to humanity. If it is, I will be very thankful to find it out,—I do not care who tells me, or what investigation has led to it.

Dr. PARK: I have been very careful about the use of arsenic, and have never used it except for the purpose of devitalization; and I believe in every case where I have had difficulty in getting an effect, I have found calcification of the pulp to exist. I recall several cases where I did not succeed in devitalizing the pulp until I had surgically removed the calcification, but as soon as I got the remedy in contact with the pulp below I succeeded. In some cases the calcification was so nearly complete in the root that it was impossible to get the arsenic into contact with the pulp.

Dr. McKellops had a case of a tooth where, after a long time, he could not succeed in killing the pulp, and had to remove the tooth, when he found the calcification almost complete. I don't remember to have ever failed myself in a case of that kind.

Dr. RICHARDSON, of London: I take a very great interest in the subject that is before us this evening, and I feel that I can but add my humble testimony. Upon the other side of the water we use arsenic with very great freedom, but with very great caution, both in cases of sensitive dentine and for the destruction of pulps. Judging from the sentiments of an assemblage such as this, I think I may say that public opinion, both here and in England, is in favor of the use of arsenious acid. I have had the pleasure of being associated with men who have discarded its use entirely, though in their opinion they were isolated. On the other hand, I have known of men using other agents, and I shall be very much pleased to introduce to your notice a new mode of treatment of the pulp at the proper time, but it would be irrelevant in this discussion, which is upon the action of arsenious acid upon the different tissues of the tooth.

Dr. TAFT: If there is anything in the experiments which Dr. Bödecker has made and the changes which he has shown us take place in the dentine after the application of arsenious acid, we should be exceedingly cautious how this agent is used. Either the indiscriminate use of it is wrong, or Dr. Bödecker is much mistaken in the observations which he has made.

Dr. E. PARMLY BROWN: I have examined with a great deal of interest the specimens under the microscope. I did not hear the paper, but I am going to read it very carefully. But with reference to the change that has taken place, is there any proof that that change is not beneficial? Is there any proof that that discoloration which you see is not for the better? Is there any proof that that part of the tooth is not going to last better than it would if the change had not been brought about? When we get at these facts and demonstrations we will know something.

Dr. HORTON: These experiments rarely ever go far enough. When the young physician gave a certain prescription to a blacksmith and found it was a perfect success he wrote out a diagnosis of the case and the remedies. He was very soon called to a tailor to whom he administered the same remedies, and they killed him. He went home and noted in his book that what would cure a blacksmith would kill a tailor. In order to ascertain for our own guidance what certain results are occasioned by and what combinations should be avoided in the treatment of our patients, we should know the temperament of the patient, the age, and the sex. Now, in all these experiments these important items that lead to our guidance are generally left out. We have given us here a certain result produced upon a certain tooth that might not occur in a hundred other cases that might be selected from a number of patients.

Dr. ATKINSON: Dr. Bödecker has told us honestly that what he had to present was only the beginning of a series of observations that he hoped he should hereafter complete, so that we might be able to apply the lessons to be drawn from them in our future practice. The paper is very clear and explicit in bringing out this fact, and inasmuch as the author says it is but the commencement of a series of investigations, and he has the modesty to state that he has not arrived at any definite conclusion upon the whole subject, all this discussion has been immaterial to the question.

SECTION VII.

PHYSIOLOGY AND ETIOLOGY.

REPORT BY W. C. BARRETT, CHAIRMAN.

THE members of Section VII. note with pleasure the increased attention which etiology is receiving from the profession. Those matters which are nearest to our eyes look the largest to us, and we may, therefore, be excused if we urge yet further study in physiology and etiology as the most important subjects which can engage the attention of the dentist. Physiology is the study of the laws which govern function, and the sole end of medicine is the attempt to regulate disordered systemic action. Do we, then, overrate the significance of this section of our work, when we claim that it is the foundation upon which all departments of medicine rest? that a thorough knowledge of physiology is requisite to the proper practice of any branch of medical science? that, in truth, all the several departments of actual medicine, surgery, practice, obstetrics, ophthalmology, otology, dermatology, dentistry, etc., are but the continued study of normal or diseased function, and, therefore, only distinct branches of physiology?

We are too apt in our essays upon, or discussions of, practical subjects, to pre-suppose in our hearers an acquaintance with the laws which govern systemic action, when the truth is that comparatively few are competent to appreciate a technical paper, because of their ignorance of the advances in physiological knowledge. Nay, more. Our literature is full of articles by authors who propose methods and prescribe remedies that evince an almost total lack of knowledge of the basal principles upon which medicine rests. Membership in Section VII., and a thorough study of the principles which it is its duty to consider, would greatly benefit most of the members of this Association, while it could harm none of those who might be comprised in the small remainder.

Etiology is fitly linked with physiology in this Section. If any man expects to practice intelligently and successfully, it is necessary that he understand, not only what normal function is, but what is the point of aberration and degeneration into diseased action. He who does not know the source and origin of any abnormal action, can but prescribe empirically, if he prescribes at all. How can one make a diagnosis or prognosis if he does not comprehend the nature of the disease; and how can he become acquainted with its character until he shall have learned its origin? In that disordered condition called pyorrhea alveolaris, for instance, the profession has not settled upon any distinct, determinate practice, because there is a diversity of views concerning its origin, or rather an ignorance of its nature in the minds of the great majority of practitioners of dentistry. Of dental caries the most antagonistic views are held by men of eminence in the profession, and, as a consequence, we are at work empirically—on the cut and try principle. Some of our best known dentists fill teeth specifically; that is, they have one specific remedy for all dental caries. They use nothing but gold, or employ only amalgam; but for this exclusiveness they are not able to render a physiological reason. What one of those who pretend to practice eclectically can exactly prescribe the pathological condition in which he always uses gold in his operations, or can intelligently describe the precise state of function which demands gutta-percha, or a mercurial filling? We are all at sea upon this subject, because of our ignorance of the etiology of dental caries.

But during the past year or two, dentistry has undoubtedly made greater advances in this direction than for a whole generation previously. At the International Medical Congress, held in London, in 1881, the cause received a great impetus, and this has been followed up by the studies and observations of a number of devoted men, nearly all of whom we may be proud to claim as American dentists. Their researches have not led all of them to the same conclusion, but in the diversity of views presented we find the best indication of the comprehensiveness of the investigations. Progress has been made, and if we cannot claim that the end has been reached, we are very sure that we are much nearer to it.

Among the views which have been urged by American etiologists the principal ones are, the chemical theory, first propounded by Mr. Robertson, of Birmingham, England, and ably advocated by Dr. Watt and others in this country; the chemico-vital theory of John Tomes; the inflammation theory, first propounded by Fox, but

modified by Abbott and Bödecker, to accord with the bioplasson doctrine of Carl Heitzmann; the bacteria hypothesis, as advocated by Leber and Rottenstein, by Underwood and Milles, and by what may be denominated the Springfield school, in this country; and the electrical theory of Mr. Bridgman, of England, which has been adopted—in part at least—by what is known as the "new departure" school of etiologists in this country.

There is another American dentist who has made extensive and original, as well as truly scientific observations—Dr. W. D. Miller, of Berlin—whose writings have attracted wide attention both in Europe and in this country. He has not adopted the views of any of those mentioned, but by a long series of experiments in the laboratories of such men as Koch and DuBois-Raymond, he has arrived at the conclusion that dental caries is not due to any one cause, but is the result of a number of factors, all of which must be duly considered in the solution of the problem. His experiments are not yet concluded, and it is to be hoped that he will succeed in throwing yet more light upon this much-vexed subject.

SECTION I.

ARTIFICIAL DENTISTRY, CHEMISTRY, AND METALLURGY.

REPORT BY T. L. BUCKINGHAM, CHAIRMAN.

SECTION I. would, in the absence of any formal report, recommend that the following named gentlemen present their views orally on the subjects placed against their names respectively: T. L. Buckingham, chemistry; W. H. Trueman, Richmond crowns; C. S. Stockton, general remarks; N. W. Kingsley, appliance for improving speech; A. E. Matteson, his method of making crowns.

DISCUSSION.

Dr. BUCKINGHAM: We are unfortunately very far behind in the branch of chemistry. We have very little literature, and we know very little about the whole matter. Chemistry lies almost at the foundation of all sciences,—even back before physiology and pathology. Anyone who will take the trouble to examine any work that is published upon the subject of organic chemistry will find how exceedingly vague it is.

How do substances act? What are the changes that take place in structures? What is the reason that arsenic sometimes will act and sometimes will not act? What is the reason some other substance will not act as well as arsenic?

When you come to building up structure, how can you know the whole process of embryology, without knowing something about the chemical changes that take place? Tell us by what process the tooth is first formed. Tell us how it grows from the molecule. Tell us how those molecules combine together. Tell us, again, whether periosteum that has been destroyed can be reformed, and if there is a new periosteum tell us by what process it is built up. These are questions that we want to get at intimately, and that come under the subject of chemistry, and we should study them more thoroughly

than we have. In some inorganic structures we can tell some of the changes that take place, but very few. We know the results. We put nitric acid on silver and nitrate of silver is formed. How does the nitric acid hold the substances in solution? When we deposit that, by what force is it deposited?

These are questions that are difficult to understand,—so difficult that we are not likely to progress very far until we get to the very foundation of the principles underlying them.

Acid, for instance, destroys the tooth-tissue. How does it destroy the tooth-tissue? What changes take place in the acid and in the tooth-tissue? What is the difference in the form of the combination? If we will study properly we may reach a greater degree of knowledge than we have now attained.

These are some of the points that pertain to dentistry, in which the dentist ought to be much more fully instructed than he is at present.

Dr. W. H. TRUEMAN: Within the last few years there has been shown a strong disposition on the part of mechanical dentistry to encroach upon the operative branch. This is probably an outgrowth of the increasing desire of the profession to preserve the usefulness of the natural teeth as long as possible. This is seen in the increased thought given to pivot-teeth; and still more, in the efforts made to dispense with partial plates, and replace them with appliances rigidly fixed to roots, or to the remaining teeth, or to both. It has indeed become a question where to place the dividing line between mechanical and operative dentistry, as these appliances, to be really successful, demand the best skill of both branches combined.

The advantages of a denture that is firmly fixed and leaves the mouth entirely free are very great. It is the nearest approach to the organs it replaces we can obtain; but there are also disadvantages associated with such appliances not to be overlooked. Unless great care is used in their construction, they will prove very temporary and a source of discomfort as long as they are retained. The difficulty of keeping them clean and free from the accumulation of food is a serious drawback to their usefulness. Where roots can be used and the fixture arranged without injury to any of the remaining teeth, there is no question that to make the attempt is good practice. But are we justified in destroying the pulp of a sound vital tooth? Are we justified in even cutting *into* a sound tooth to secure anchorage for such an appliance? Would it be good

practice, for instance, where a lateral was missing, to destroy the pulp of a perfectly sound adjoining canine, cut off the crown, and mount two teeth on its root; and, perhaps, also, cut a cavity in the central to give the fixture additional firmness, as I am told is being done,—I am pleased to add,—by dentists who advertise extensively, for I cannot conceive that a *real* dentist would ever commit so great an outrage?

We may often to advantage make one root support two or even three teeth where the conditions are favorable, as I have done several times; but when we make an appliance that is rigidly fixed to two or more roots or teeth, is not the risk of failure largely increased? We all know how uncertain a pulpless tooth is. Is it not a great risk to rigidly fasten several of them together with an apparatus that is not readily removed? What will be the probable result if any of them become inflamed, as they are so liable to do? And again, the advocates of bridge-work, as it is called, urge the attaching of eight or ten teeth, or even an entire denture, to four roots. What will be the probable effect on the four roots thus made to do the work of two or three times their number? It seems to be one of those things in which it will be well to advance slowly. It may be practicable. I saw two such arrangements in the same mouth, constructed in Paris about 1856. On each jaw were about ten teeth, mounted on a heavy half-round gold wire, and rigidly fixed to about four roots. The roots had been plugged with wood, and gold pivots soldered to the fixture driven into it. In each jaw were several natural teeth, but the denture had no connection with them. Nearly all the roots of the missing teeth were in; they had been filed down, and the wire rested upon them. I understood from the patient that she suffered very much for several weeks after they were inserted. When I first saw the case, it had been in place about twenty years, had never been removed, and had given entire satisfaction. It was lost some five years afterwards from recession of the gums loosening the roots. In that case, there is no doubt the patient had a far more comfortable and satisfactory denture than plates would have been; but, I must add, the odor from the roots and the accumulation of food the patient was unable to remove was very, *very* vile.

Bridge-work is not to be utterly discouraged; in skillful and discreet hands its capabilities are great, and so long as it is confined to roots or teeth of little value, it can be made to relieve the patient of the inconvenience of a plate,—at least for a time,—make a more

serviceable denture while it lasts, and if it does hasten the loss of the roots, it leaves the mouth in no worse condition for a plate than it found it. When we see how much has been done to make pivot-teeth more permanent and cleanly, who can say what persistent effort may not do in that direction in the future?

Dr. STOCKTON: I hope very much that the other Sections connected with this Association will be able to promulgate knowledge among the members of the profession and the world at large, so that very soon there will be no occasion for a Section on Artificial Dentistry. It is difficult now to discern just where the line between operative and mechanical dentistry should be drawn.

Take, for instance, such operations as Dr. Bonwill performs, which seem to be entirely in the province of operative dentistry, and, on the other hand, such operations as are performed by Dr. Matteson and Dr. Richmond and others, which seem to belong almost exclusively to the mechanical department. Hence it is a very difficult thing to decide what belongs to one department and what to the other.

There is one fact brought to notice by Dr. Trueman, which, it seems to me, should receive the condemnation of this intelligent body, and of all other enlightened dentists. It is this: I understand the practice to be, when the loss of one or more teeth has been sustained, to advocate that an adjoining tooth, sound and useful, shall be sacrificed—cut off—and upon its root the two or more teeth be placed, in order to avoid the use of a plate. A very intelligent gentleman made the remark, which seems to me almost justified, that anyone who would be guilty of such a practice as that deserved to be horse-whipped.

My attention has been called to a new mode of holding in the mouth an entire upper denture. It is to do away with the central suction cavity, and to secure it upon the alveolar ridge. I present the plate for your inspection. The inventor tells me he has tried it in a number of cases, and there is no difficulty except for a short time,—a day or two,—when he has an entire adaptation of the plate to the mouth. I am inclined to think very favorably of this. I remember the case of a prominent preacher who had to have a set of teeth made about every six months, and he said to me that he was afraid he would have to give up preaching. The plates got loose. I made him a plate without any suction cavity, and from that time to this I have never had to change it. I believe a perfect adaptation of the plate to the mouth is a great deal better than depending upon a little place in the centre to retain it.

Dr. BÖDECKER: About six or seven months ago, at a meeting of the New Jersey Central Dental Association, Dr. Timme, of Hoboken, exhibited a hydraulic press, invented by Dr. Robert Telschow, of Berlin. It appeared to me that this was an exceedingly good idea, and I determined that the first opportunity I had I would use this method. Dr. Timme has lately struck off two gold plates for me with the press. The particulars of this process are as follows:

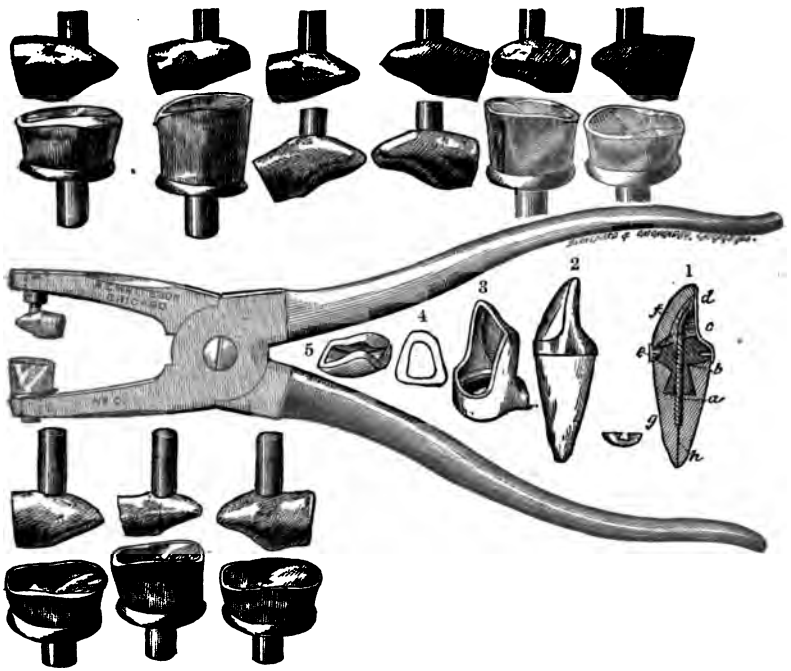
The plaster impression is taken, and into this a compound of sulphur and plumbago (Spence's metal) is poured, which melts very quickly, and very quickly hardens. This is removed from the plaster impression, and a gold plate is pressed over this with the fingers as well as it can be done; or, a zinc die is made, and over this the gold plate is roughly hammered, as the Spence metal will stand any amount of pressure but no hammering. The gold plate and a piece of rubber which holds it in its place are put into the hydraulic press. The press will force it home with greater accuracy than I have ever seen accomplished by any other process. The pressure is about eight hundred atmospheres to the square inch. I have seen a good many plates fitted in the mouth, but I have never seen any that fitted so perfectly as those made by the hydraulic press.

Dr. PRIEST: The method of pressing plates into form has been advocated before this Association at a previous meeting. I think a better way is to cut the plate near the centre of the anterior portion, allowing it to lap as it is bent into shape, first forming it in the palatal arch (after cutting), which will allow the metal to move laterally; and with a die made by pouring lead into the arch of the zinc die, making what is often called a frog, then placing tough paper or thin cloth at each side of the plate, it can be easily and quickly driven, and made to approximate the form of the palatal arch, when the remaining portion can be readily shaped over the alveolar ridge, the lap reduced to the proper width, the edges beveled, and, after it is quite well fitted, soldered. If done nicely, and with fine solder, it will be hardly thicker than the plate; and, if properly finished, will not melt or flow during any subsequent heating. I consider it necessary in forming all "suction" plates to make two sets of dies (and sometimes the third), to produce a perfectly formed plate.

Dr. MATTESON: The improvement in the crown which I have to offer to the profession will necessitate a somewhat lengthy description, and as I have no notes here you will excuse me if I do not make it as clear as I would otherwise.

[Dr. Matteson intended to have had cuts to illustrate his remarks, but they did not arrive until too late. He has since furnished them, and his remarks are made to refer to them.—CHN. PUB. COM.]

The crown is formed with a shell (Fig. 3) which covers the lingual surface, extending around the sides and cutting edges and with a narrow band (*e* Fig. 1) embracing the circumference of the root in front at the gum, and into the opening thus left, is fitted a porcelain front (Fig. 5), presenting very much the appearance of the Richmond crown. The shell is made of gold and platinum plate,—gold on one side and platinum on the other,—of about No. 33, standard gauge.



The porcelain front is a plain plate- or rubber-tooth, with a dovetailed slot, which is cut with a corundum wheel and disk, running lengthwise of the tooth. The root is prepared to receive the crown by enlarging the canal two-thirds of its length, so as to receive a platinum wire screw, No. 16 to 18, wire gauge, the screw taking firm hold when inserted. The outer one-third of the pulp-canal is further enlarged with a cone-shaped bur with its base toward the apex, and the end of the root countersunk.

A platinum ring (Fig. 4) is fitted to the inner circumference of the shell, so that when in position the ring rests on the end of the root and about midway of the width of the band in front, in which position the ring is soldered. The porcelain front is then fitted into the opening in front, and the screw is inserted and cut the required length; the screw should extend about two-thirds of the length of the crown.

The root is filled around the screw, and the end of the root is covered with amalgam or cement, the crown adjusted, and the packing of the filling continued through the opening in the front, covering the ring in the shell,—if amalgam is used about one-half of the shell should be filled,—leaving sufficient room to insert the front.

Into the dovetailed slot and in the front and remaining portion of the shell is inserted sufficient cement to complete the filling, when the front is inserted, the excess escaping around the edges, which are burnished around the front.

The appliances for making these shells are in the form of dies and counter-dies, which are interchangeable in forceps made for this purpose. Each set comprises dies and counter-dies for the six superior front teeth, two lower cuspids, and one lower incisor. The inner surfaces of the lower incisors of the two sides are so nearly alike that but one die and counter-die are needed for both.

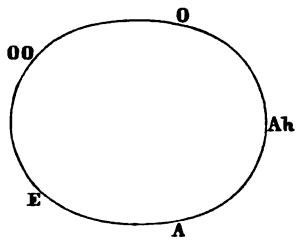
Dr. KINGSLEY: I observe among those present some gentlemen who have heard me speak fully upon my present subject—"Articulation and the Mechanism of Speech"—years since, and I have to ask their indulgence for some things I shall say which to them may appear ancient history. To such I would say that there is really nothing new in what I shall present, for the years that have passed have only served to prove by repeated demonstration that the opinions I then advanced were true.

I have devoted more than a quarter of a century to the study of the subject, have performed many experiments to improve the speech of those afflicted with cleft palate and have probably seen a larger number of such cases than any other person.

The physiological and philosophical origin of articulate speech lies in the vibration of the vocal chords, which creates vibrations or waves in the passing current of air, and such waves reaching the ears of the hearer produce the effect we call sound. Sound and voice may here be used as interchangeable terms. The sound produced by the vocal chords may be one in tone, note, and key, but in passing through and out of the mouth it becomes changed by the alterations in the form and size of the buccal cavity. The one note produced when

the mouth and the fauces are wide open is the vowel *Ah*, and all the other vowel-sounds which are heard in any language are but modifications of the sound *Ah*, made as above described.

In the English language we have five distinctly marked vowel-sounds, but the division of the one note, *Ah*, into the five vowels only, is more arbitrary than otherwise. We can illustrate the entire scope and compass of vowel-sounds by the accompanying drawing:



By sounding each one of these vowels as named separately and distinctly, beginning with *OO* and continuing with *O*, *Ah*, *A*, *E*, and then repeating the same order more rapidly until there becomes one continuous sound, it will be seen that the division into five sections or vowels is entirely arbitrary—a matter of convenience and a concession to unappreciative ears. If our ears were as finely attuned as those of some of the lower animals, this cycle of sound might have fifty divisions or vowels instead of five, but for the general purposes of spoken language distinctions in vowel-sounds should be strongly marked, and more than five are not likely to be appreciated. These five sounds, together with interruptions, make up in their almost infinite combinations the whole of spoken language.

The interruptions or stops we call consonants, and were it not for the liberal use of consonants any spoken language would be very limited in its scope and expression.

The effect of the consonant is very simply illustrated by sounding the vowel *Ah* and stopping the sound by shutting the lips; if the vowel is continued on opening the lips, *Ah* becomes *Bah*, and in a similar manner all consonant sounds are produced.

Cleft-palate patients are generally able to produce the vowel-sounds without difficulty, but many of the consonants are entirely wanting, and with such a fissure it is impossible to produce them. Some of the consonants depend solely upon the integrity of the normal palate, and others even are more or less affected by its rupture.

In many instances so large a number of consonant-sounds are imperfect that the speech becomes absolutely unintelligible. It is then that an artificial palate becomes a most beneficent provision. * * I am annoyed from time to time that real knowledge makes so little progress. More than twenty years ago I discovered that the surgical operation of bringing the sides of the fissured palate to-

gether, no matter how perfect the union might be, did not produce perfect speech, the reason being that the newly-formed velum is too short to reach the posterior wall of the pharynx, and by thus closing the passage to the nares enable the patient to make the defective consonant-sounds. There is a lack of tissue or material in the remnants of the palate when cleft to enable surgery to both bridge the fissure and get sufficient length for proper articulation. The surgical palate is too short *and always will be.* I have preached that doctrine over and over again, and when I could get the ear of a scientific man long enough to thoroughly understand what I meant by it, he was always convinced, so much so that in every instance where a surgeon had been sewing up cleft-palates he recognized the cause of failure and abandoned the operation. Not a distinguished surgeon in New York city will operate for cleft-palate, because he does not believe he is doing the patient any good.

I will repeat the statement, that unless there is absolute closure of the space between the soft palate and the posterior wall of the pharynx, distinct speech, as we have it, is impossible. I have resorted to mechanism to supply the defect; but with all that has been accomplished in remedying the difficulties in the way of perfect speech for this class, I am obliged to say that I have rarely seen a cleft-palate patient in whom there was not a slight peculiarity of *voice*, even after the best service that was in my power had been bestowed. This peculiarity is a peculiarity of *voice* and is the result of a different resonance, caused by the abnormal naso-pharyngeal cavity, and is likely to be always associated with a mechanical appliance. It does not always occur, but when absent is probably the result of accident rather than design. No one can with certainty overcome such abnormal resonance except by repeated experiments upon the same individual, and the experience gained from one case might not apply to another similar one.

This peculiarity of voice (which the speaker illustrated by speaking for a moment with one nostril closed) must not be confounded with indistinct articulation or enunciation. I have seen scores of patients wearing artificial palates whose distinctness of utterance was quite the equal of anyone in this room. In fact, there are many persons present taking public part in the proceedings whose articulation is more defective from a critical stand-point than that of many artificial palate patients.

The kind of apparatus best adapted to produce such results is not always the same, in shape, material, or principle. I believe, all

things considered, that the principle of most universal application, the one most likely to ensure the best results, is that of an elastic artificial velum, filling the cavity and under control of the muscles in the adjoining tissues. Such a velum more nearly resembles the natural palate in character, function, and action, than any other appliance which has yet been constructed. With it the buccal-vocal tube or the nasal-vocal tube may be changed in form and resonating power, as the velum comes to be under the control of the wearer, and only under such circumstances can the most perfect articulation be learned. Nevertheless, I have seen patients who have so overcome their defective articulation by wearing an elastic velum, that they could still articulate well when a non-elastic apparatus was substituted. I have therefore in many cases substituted an obturator of peculiar form and with excellent results. Such obturators or artificial palates are sometimes made of gold, sometimes of platinum, but generally of vulcanite. Their peculiarity consists in a hollow bulb which occupies the naso-pharyngeal cavity and adapted with great care to the contracted condition of the surrounding muscles.

With such an instrument the burden of articulation devolves upon the action and education of the constrictor pharyngeal muscles and requires more skill to articulate all the sounds of our language properly than is required with an elastic velum or with well-formed natural organs.

Dr. THOMAS: Does not the speech improve with the continued use of the apparatus?

Dr. KINGSLEY: There will be no improvement in the speech at first. By experience we learn to know when the apparatus for a given case is what is required to enable the patient to acquire correct articulation. If you purchase a Steinway piano, you have no guarantee from the maker that you can make music. The instrument may be as perfect as it is possible to make it, but you must *learn* to play upon it. So with the apparatus for the cleft-palate patient. It may be just what is required to enable the patient to articulate properly, but as to how long it will require for the patient to learn to use it I do not know. It depends largely upon the aptitude of the student. Some learn much more quickly than others.

But in all cases there is no pronounced improvement immediately; it is at first almost imperceptible, and may go on gradually for years. Some patients will speak exceedingly well in a few months, while

others may never overcome the bad habits formed with deficient natural organs.

The age is an important factor in the problem, as the younger one begins to break up bad habits of speech or attempts to acquire a new language the more hopeful the result.

Dr. WATKINS: I have a case in practice of a lady about fifty years of age, who has been an invalid for seventeen years. The molars and bicuspids of the upper jaw have been removed for a long time. The alveolar process is entirely absorbed, and the mouth almost flat and very small. I inserted an upper set on rubber, and to my great satisfaction I secured a beautiful suction; the teeth seemed to stay in place very well. The process being so much absorbed I made the teeth pretty long. When she went to eat, however, the teeth would wobble all over her mouth. She tried them for two or three months, but could not seem to improve upon them, so I told her I would make her another set, and so I did, and in this case I made the teeth short, as I thought perhaps the length of the teeth had something to do with her difficulty in using them. I have now obtained a suction that I cannot break by taking hold of the front teeth, yet when she attempts to eat the teeth wobble in her mouth as before, and the suction breaks the moment she tries to bite anything with her side teeth. I would like to have some gentleman tell me what to do in this case.

Dr. STOCKTON: I think if the doctor will make the teeth so that there will be about the thirty-second of an inch between the upper and the *natural* lower teeth, she will be all right. She strikes the natural lower teeth somewhere and tips the plate.

Dr. HARROUN: I think there might be another difficulty, owing to the yielding of the soft parts under the plate, and the plate not being fitted properly at the sides. If this is the case I would trim out the plaster model so as to equalize the pressure.

Dr. DICKERMAN: I think there might be still another difficulty. The leverage may not be on the line of the alveolar ridge.

Dr. HORTON: There may be another difficulty. I often find such trouble from there being soft places. There is a soft part under the plate somewhere, where it rests well enough when she is not eating.

Dr. CRAVENS: At the age of fifty years, the natural teeth have become smooth on their occlusive faces. If you put in teeth the forms of which represent the age of the patient, you will probably have no trouble. A person of fifty years cannot chew with artifi-

cial teeth that bear cusps. The grinding faces should be ground plain for the aged.

Dr. MORRISON: I would like to make a few remarks in regard to artificial crowns. I want to enter a protest against the method of cutting the crowns of teeth so heroically. I think a great mistake is made by cutting the whole crown down to the margin of the process or the margin of the gum, and then adjusting the crowns so as to crowd upon the process.

I have noticed several appliances, made for cutting the roots of the anterior teeth, by which pivot-teeth are inserted upon correct tenoning principles. They cut a tenon on the root and adjust upon it a metallic cap, which is made by machinery to fit accurately. I have no respect for a tooth of that kind put on in that form. It has no regard for the festoon of the gum, and if you carry it to the gum on the labial surface it must be very much under the gum on the approximal surfaces. All of the root should be preserved and as much of the crown as possible. Then restore the remainder with a metallic crown or section of a crown, making strong and durable work, but never cut away a half or third of a natural crown to substitute a porcelain one.

Dr. E. PARMLY BROWN: One of the most objectionable things to me in the past in mechanical and operative dentistry has been the making of artificial crowns, and this branch of dentistry is the only one that I have neglected. I have been experimenting for nearly twenty years, and have at last succeeded in producing a crown that will accomplish all that could be desired. I can conceive of no root of a tooth, dead or alive, that is fit to remain in the human mouth that I cannot crown with my system.

The first set of appliances, on which I have received a patent, I will exhibit to you, and if there are any gentlemen here who have any objection to patents, I will immediately sit down.

(The doctor illustrated by the blackboard his method of applying the crown.)

Dr. HOWE also illustrated his method on the blackboard and by means of his instruments devised for this particular work.

Dr. BARRETT: I want to present an idea, not original, but of value in the setting of gold crowns. Copper is rolled down quite thin, and a band three-fourths of an inch wide wrapped about the root of the tooth and forced up under the gum. A ligature is passed around both, the copper band is burnished down, and the ligature drawn tight. This copper band will now fit just about as we want the gold

band to do. Plaster of Paris is then inserted in this, forced up against the end of the root, and permitted to set. Take it off and if you use Babbitt-metal a piece of paper wrapped about it will lengthen it out sufficiently, when the melted metal may be poured into it, and thus a perfect model of the end of the root will be secured. That part that is inserted in the copper is the exact reproduction of the root of the tooth. The model will perhaps need a little dressing down with a file, when the gold band may be fitted about it and soldered, thus avoiding the necessity for the annoying and painful trying on in the mouth. I believe this marked improvement was devised by Dr. H. A. Baker, of Boston.

SECTION II.

DENTAL EDUCATION.

REPORT BY C. N. PEIRCE, CHAIRMAN *Pro tem.*

SECTION II., Dental Education, in the absence of its chairman, was organized by selecting C. N. Peirce as chairman and Dr. Thomas as secretary. It is greatly to be regretted that the chairman of so important a Section elected at the close of the session of 1882, should not be present with his report, and especially so as the work outlined at that time was of such a nature as to require time in its preparation. This Section, however, presents the following for your consideration:

In reviewing the educational field, we find subjects which have in previous years claimed the attention of this Association still unsettled; but advanced steps have been taken which awaken a new interest, and give great promise of a flattering and bountiful harvest. The most important of these is the formation of the national organization of the State boards of examiners. This body, called into existence within the last few months, has for its object the promotion of a high and uniform standard of dental education; this work it hopes to accomplish through the local State boards of examiners. Organized by the adoption of a constitution and the election of officers, it becomes an important factor in the promotion of dental science; especially as it already embraces in its membership representatives from nine State boards. Its efficiency in this work will, as stated above, be through the influence it may be able to exert upon the State societies and their boards of examiners.

That this American Dental Association may more fully realize and appreciate the efforts of this new ally we append a few of the resolutions which were considered and adopted at its late meeting:

Resolved, That this National Association of State Boards of Examiners enjoin its members not to accept the diploma from any college which does not require two full regular courses of lectures, or its equivalent, one full course and five years' practice, previous to granting such degree.

Resolved, That this association insists that boards now connected with this body shall not confer degrees or titles of any nature.

Resolved, That this association recommends to the State societies of all States where no law exists, the necessity of an immediate effort for such legislation.

Resolved, That this association furnish all State societies with a copy or copies of a well-digested law, so that uniformity in legislation, as far as practicable, may be attained.

Thus you see that the work already undertaken by this new organization is in a line with much of that which has in previous years claimed the attention of this Section.

The subjects of the most efficient means of obtaining a dental education and of the requirements which should be exacted from the student by the various educational institutions before granting a dental degree, are still eliciting much discussion and varied opinions. There are some members of the Section who maintain that, were a medical degree first required before the student commenced the studies pertaining especially and only to his specialty, great advantage would accrue by virtue of this enforced culture. Others maintain that the medical and dental studies can be pursued simultaneously, the student electing from the medical curriculum the studies which are common to both professions; while others again maintain that in an exclusively dental school an education is secured which contributes most to the needs of the dentist, and hence promotes more thoroughly the culture and advancement of the dental profession.

The views expressed by members of the Section regarding the course or extent of study to be required previous to graduation are not less varied than those on the means of obtaining the education: some contending that two full courses, with previous training under a preceptor, before examination and graduation, is the only legitimate method to secure the highest degree of proficiency, while others maintain that five years' previous practice is quite equivalent to the first year of college instruction; and two members of the Section have expressed the opinion that faculties are quite justified in giving the student an examination whenever he may request it, without reference to the time of study pursued in their institution, they believing that their duty to the public and the profession was fully accomplished by this means of obtaining a knowledge of the ac-

quirements or proficiency of the applicant. It was the opinion of a large majority of the Section that this latter method was liable to many abuses and fraught with much danger to the best interests of the profession.

The sentiment of the Section was best expressed by the passage of the following resolution, which they recommend for your consideration and adoption:

Resolved, That the interests of the profession and advanced dental education both demand that all dental educational institutions shall require that every student, before being admitted to examination for the degree of doctor (or master) of dental surgery, shall have taken two full courses of lectures or its equivalent.

DISCUSSION.

Dr. HAYHURST: We are about entering upon a new era in this matter of dental education. We have been laboring for years past in the dark. We have not had those facilities for acquiring the proper education which ought to be the foundation of every profession in our land.

A few days ago at this place, in the formation of a National Association of Boards of Examiners was inaugurated a movement which must tend largely to the elevation of the standard of education, and to render the profession more honorable and efficient and desirable to enter into.

The discussion in reference to the effect of arsenious acid, and the possibility that the same effect may be produced by other agents, seems to suggest that it is not safe to adopt a settled theory upon any subject until we go to the root of the matter and inquire fully into the causes. We see agents at work, and yet we know not what they are. And we can only examine them as we study the effect they exert on matter upon which they operate.

The subject of dental education is so broad that we should strive to unite our best thoughts, and to lay a proper and sure foundation which will be of benefit to ourselves and to those who propose to enter our ranks.

Dr. CROUSE moved the adoption of the resolution as presented by the Section.

Dr. ATKINSON: I have an objection to the resolution on account of its ambiguity. What is that "other equivalent?" Any greenhorn can pass a body that is willing to confer an M.D.S. The impudence of a State enacting a law that shall make a new degree

when there had already been degrees established before! The M.D. and the D.D.S. are fully recognized in that little bit of equivalent. Besides that it simply names the degree that ought not to be regarded as a degree at all. In my former conversations upon this subject and in my efforts to get at the best methods of education, I have advocated either giving the student a certificate of the degree of advancement that he actually had made, or else make one degree to cover the whole ground and not to have a multiplicity of degrees; and if this body is a representative body of the consensus of the dentists of the United States, I think we ought to be careful how we adopt resolutions that will be ambiguous in their interpretation, and open the door to just such corruption as that which we are trying to strike against now.

Dr. PEIRCE: I would move to strike out the last three words, "or its equivalent."

Dr. BUCKINGHAM: I would like to ask what you understand by institutions. Do you understand colleges and institutions of that kind, or do you include these boards of examiners all over the country?

Dr. CUSHING: It says educational institutions. A board of examiners is not an educational institution.

Dr. ALLPORT: What institution confers the degree of M.D.S.

Dr. CUSHING: None but the State Board of Censors of New York.

Dr. ALLPORT: I move to strike out all in regard to Master of Dental Surgery. It certainly will be ambiguous in that way.

Dr. HAYHURST: I presume that sentence alludes to an effort made by the State society of the State of New Jersey, who went before the legislature last fall and endeavored to have the power conferred upon the examining board to confer the degree of Master of Dental Surgery. There was a great strife. Prominent men belonging to the profession in the State of New Jersey appeared before the legislature, both for and against the proposed action, and they had a very warm time of it,—so warm that some assistance was called for from a neighboring State in order to defeat the movement. Finally it was defeated, but I believe it is intended to make a future application.

Dr. BARRETT: Perhaps, to prevent misapprehension and to have a more clear understanding of this question, it will not be out of place for me to give a little explanation concerning the degree of Master of Dental Surgery, as existing in the State of New York. That provision of the law was the child of old Dr. Amos Westcott,

of Syracuse. It was not intended to be used as an evidence of any scholastic training whatever. The board of examiners require certain educational qualifications, but they demand more than that. They insist that the man who makes application shall present such testimonials as will satisfy the members of the board that he is in reputable practice,—not simply that he is qualified for a degree. I think since the institution of that degree the sentiment among many dentists in the State of New York has materially changed. That the degree has done us good, I firmly believe, but I am not sure but that if to-day a vote could be taken of all the members of the dental associations of the State of New York, it would be opposed to the granting of any such diploma.

Dr. STOCKTON: I am glad the resolution has been introduced, for it will strengthen our hands in the fight in New Jersey. We have been accustomed to follow the great lights of New York, and have been glad to do so, when they have been right, but though they be bright and shining, we cannot do so when they are wrong. Their baneful light has penetrated into New Jersey, and the dentists there applied to the legislature last winter for a law giving authority to the board of examiners, composed of five members, from two- to three-fifths of whom are not degree men, to confer the degree of M.D.S.

I was told it was a copy of the New York law, but I find that not quite the fact. The New York law has some restrictions; the proposed law in New Jersey none. But even with the New York restrictions it is bad—altogether bad. D.D.S. means, or should mean, a dentist, and is the only degree that should be recognized. You see the M.D.S. and D.D.S., and then again you see the D.M.D. and D.D.S., and you think the possessor of such a string of letters to his name is some great wonderful being, but after all he is only a common dentist, just like the rest of us. No, let us have one degree, and but one. Your examining boards may confer a certificate, if need be, but not a diploma. A man in this late day of dental colleges, in this day of education, who has not a degree, is either too ignorant or too lazy to possess it. It may have been all right for New York ten or fifteen years ago, but now the brethren there should place themselves squarely in harmony with the sentiment of the dental profession. I hope no State examining board will ever confer a degree. I would much prefer to see the stand taken that the D.D.S. will only be conferred upon those who are already M.D.'s than to see this back-track taken. I sincerely hope the resolution will pass.

Dr. PEIRCE: If the members of the Association observed the read-

ing of the report, they would recognize the fact that I had endeavored to represent the different views expressed by members of the Section. That resolution was drawn up, first, to get the unanimous sanction of the Section. It was also framed so as to bring out just the expression that we have had here. I want the Association to recognize that we have institutions and organized bodies which are conferring degrees upon examination alone; and I am glad that this imperfect report has brought out the expression we have had. The resolution has now been sifted and amended so that it reads intelligibly, and I trust that the Association will adopt it as it now stands.

Dr. MARCKLEIN: We have in Wisconsin, organized under the laws of the State, two institutions represented to be educational,—one a dental and the other a medical institution. Any person, no matter how poorly qualified, can obtain a diploma for the large sum of twelve dollars in cash, conferring all that any diploma confers upon anybody.

The Wisconsin State Dental Society have for the last two years made strenuous efforts to have the institution known as the Delavan Dental College exterminated, but we find it is a legal institution. It is impossible to exterminate it unless the law is repealed.

I should like to have in this report one word added, so that it will read, "reputable educational institutions."

Dr. ALLPORT: I can see no use in the amendment just offered by the gentleman. I think public sentiment is sufficient to correct the abuse referred to. I believe all our State boards have provided against any State board diploma being made useful in any other State than where issued. So far as the Delavan institution is concerned it is too palpably a fraud to have any influence with a board of examiners or an association of this kind, and our time would be wasted to notice it. These are matters that belong to the legislatures of the individual States and not to this Association at all.

Dr. CROUSE: The State boards of examiners have taken one great step in not recognizing anything but reputable colleges. I hope by another year the national organization of the boards of examiners will be powerful enough to exert such influence as will compel all the colleges to give at least two full courses of lectures, and not allow five or even ten years' practice as an equivalent for one course. This Association has been trying for the last ten or twelve years to accomplish that purpose, but the boards will probably have more power to bring it about than we have. I am in hope that the colleges in time will be so regulated that it will not be necessary to have State boards. All the labor unions have a much better educational or-

ganization than we have. The plumber's apprentice cannot work as a journeyman for four years. A man can go through any dental college in this country in much less time.

Dr. BUCKINGHAM: Would it not be better to pass a resolution that no professor in a dental college should be on a State board? As professors they advocate two years' study, and as members of the State boards they do not require any time.

Dr. REHWINKEL: Our friend Buckingham seems to be very much agitated about the State boards; there is an impression on his mind that the State boards and colleges are entirely incompatible. He forgets as professor of a dental college that when he confers a degree upon the students, he not only certifies to their ability and qualifications for the practice of dentistry, but he confers a distinct honor upon them, which gives an entrance to the profession wherever they may be. Is that the case with a simple certificate of qualification given by the State board? It is not. The State boards simply certify to the qualifications of those to whom they grant certificates, so that they may practice dentistry legally under the laws of the State. It is not the business nor is it the right of the State board to inquire where their education has been obtained. It makes not a particle of difference whether it is obtained in a college or whether it is acquired elsewhere. The sole business of the State board is to ascertain whether persons who come before them can be allowed to go at large and practice dentistry in a harmless way without doing great injury through ignorance. We cannot prevent their doing harm from malice, but the law wants to guard the public so that they shall not be imposed upon by the practitioner of dentistry through ignorance merely. They cannot inquire into the moral character of men.

When you examine a candidate in your college, before you give a diploma, you not only ascertain,—if you do your duty,—whether he is qualified, but you also inform yourselves whether he is an upright, honest, trustworthy young man. We are approaching nearer to the time when we can do away with boards of examiners, when anyone who desires to come into the dental profession will come through but one door, and that is through a regular college education.

Dr. PEIRCE: The dentists in the State of Pennsylvania for some years tried to have a law enacted for the protection of the public, and finally, when it was sent to a committee of the legislature, they stated in a conference with the dentists that it would be burdensome to the young men in the State who have been practicing, or who wanted to practice, if it forced them to go to our colleges.

As a compromise we said that we would have a State board of examiners, and that the State board should have the power to examine applicants, and if found qualified to practice they would be granted certificates allowing them to pursue their industry without reference to whether the education was obtained at college or elsewhere. The law has been an advantage. Every year brings us nearer to the time when the State boards can be abolished, because the student will seek the schools. The people are becoming educated, and are feeling that there is an advantage to be gained by patronizing the dental practitioner who has taken his full course of instruction over those who are simply self-taught. Since we have had our law and State board of examiners, four of the gentlemen who have taken certificates from the board have gone to college and taken the degree, and they have since appreciated the advantages of such a course. Since 1875 we have had forty-six candidates for examination, fifteen of whom received the certificate, and the rest were refused on account of disqualification. Several of those who were disqualified have since attended schools and become proficient. In this way the law has operated advantageously.

Dr. ALLPORT: If our State boards of dental examiners do their duty, as I believe they are disposed to do, they will really become the regulators of our entire system of dental education. To illustrate: in the State of Illinois our State board of health determines who shall be allowed to practice medicine within our State by determining the diplomas of what colleges shall be accepted as evidence of qualification for practice without an examination by the board. If our dental boards will unite in this matter and judiciously determine the diplomas of what dental colleges shall be accepted as evidence of qualification to practice dental surgery, and judiciously examine all who do not hold such diplomas before allowing them to practice in the several States, the great work of dental education will be very much promoted. This is why I say our State boards should be commended, and that they are hereafter to become the regulators of dental education.

Dr. HAYHURST: I think there is an important distinction always to be made between the certificate granted by the State boards of examiners and the diploma of the college. The certificate is not a diploma in any sense of the word. Having been a member of the State board of New Jersey since 1873, and being conversant with the nature of the examination, I consider the boards an instrumentality that tends to nourish the dental colleges.

SECTION III.

DENTAL LITERATURE AND NOMENCLATURE.

Nomenclature of the Art and Science of Dentistry.

REPORT BY J. TAFT, CHAIRMAN.

LANGUAGE is the vehicle of thought from one person to another. This communication is perfect and efficient in proportion as there is precision and definiteness in the language used, and a correct and uniform understanding of its meaning. Language should be definite and used upon such a basis as will give it the greatest range of usefulness and most enduring stability. A word is an utterance of the human voice which expresses a thought, or names a thing or action. The imperfect use of words occasions confusion of thought and ideas and impairs the value of language. Perhaps there never was a greater tendency to mutilate, adulterate, and dilute a language, than now exists in respect to the English. For this there are several reasons. It has largely incorporated with it, and indeed is mainly made up of material from many other languages. The large admixture of different nationalities in this country is a prolific source of vitiation of pure English. People of other nationalities abound with us; their efforts to use our language result, as a rule, in a mixed speech quite at variance with pure English. Their errors and incongruities are too often imitated by those who should avoid them. Education has become popular, and a large proportion of the American people desire to appear at least to be educated and cultured. The reality is, however, often much below the assumption: hence the misuse and abuse of language greatly abounds. Many are in the habit of using words and phrases, of the true meaning and power of which they have little or no conception, even in the grosser sense. The would-be scientist is often guilty of the most absurd use of names, terms, and phrases. The press pours forth a ceaseless current of literature, incalculable

in amount, the preparation of which is too often in the hands of those unfitted for the work. The free indulgence in slang words, phrases, and provincialisms, tends greatly to the corruption of language. Loose and careless habits in the use of language weaken its power and lessen its efficiency.

"The Anglo-Saxon, with its immediate descendant, the modern English, is said to have the strength of iron with the beauty of burnished steel. It is the mother-tongue of the English language. About three-fourths of the words in common use are from this source. Not only in the number of words but in their peculiar character and importance, as well as their influence on grammatical forms, Anglo-Saxon constitutes its principal strength; and at the same time its chief peculiarities of structure and idiom are essentially Anglo-Saxon. From the same copious fountain have sprung words designating the greater part of the objects of sense and the terms which most frequently occur in discourse, and which recall the most vivid conceptions, as sun, moon, earth, fire, day, night, etc.; and words expressive of the dearest relations, the strongest and most powerful feelings of nature from our earliest days, as mother, father, sister, brother, wife, home, etc. The language of business, of the shop, of the market, and of every-day life, our national proverbs, our language of humor, satire, and colloquial pleasantry, the most energetic words we can employ, whether of kindness or invective; in short, words expressive of our strongest emotions and actions, in all the most startling scenes of life from the cradle to the grave, are derived from the Anglo-Saxon. Every speaker or writer, then, who would not only convince the understanding but reach the affections, should adopt Anglo-Saxon expressions, which, from early use and dearest associations, excite emotions and affect the heart."

Every department of human occupation has its peculiar names, words, and phrases. In some they are far more numerous and prominent than in others. This is true in a remarkable degree in the professions, for instance, law, theology, and medicine; distinctive names and phrases more abound in the last than in the former two. There seems to be a necessity for this, growing out of the multiplicity of parts and their relations to each other and their reciprocal influence.

In medical literature a large proportion of the special names are taken, changed but little, if any, from other languages, and chiefly from the Greek and Latin. The propriety of anglicizing these names is a question about which there is some diversity of

opinion. The rendering more plain and understandable these names and phrases would seem to be very desirable, inasmuch as a large majority of those who engage in the study of the branches in which they so greatly abound have but little or no knowledge of any other language than English. Oftentimes the student will struggle with names and phrases without a knowledge of their meaning for months and even years. Nothing that can be as well designated by the pure English word or phrase should be named by words of another language, because a large proportion of those who study the professions are not familiar with those languages, and especially the Greek and Latin. Usually the names from these languages used in descriptive anatomy and pathology are not more expressive nor better in any sense than well-chosen English names and phrases. A large share of the labor in mastering these branches consists in becoming familiar with the nomenclature.

The growth of language is slow, and change cannot be rapidly introduced. In the use of language for conveying thought, that which is best adapted should be employed, using only those words and terms that will most clearly and fully designate the thought, object, or action. Many names are used upon analogy or association that will hardly stand the test of close criticism. To some of these reference will be made as we proceed. It is said that in the development of art and science new words and phrases are a necessity, but in introducing these caution should be exercised. Every new word, name, or phrase introduced should be made clear and comprehensible to every reader before it is generally employed. Its origin and significance should be such as to commend it to the judgment of every one of general culture.

In the art and science of the dental profession there are many *distinctive* names and phrases. For the most part, perhaps, these are well chosen, and as expressive as is possible in the present state of our language. There are, however, quite a number of nominations of very questionable propriety. To a few of these we now propose to call attenion.

The different teeth have different names,—some of these sufficiently distinctive, as for example, the incisors, the molars, the bicuspids, the cuspids, etc. To some of them, however, names are frequently given which are of doubtful propriety. For example, the cuspid teeth, both superior and inferior, are often called *canine* teeth: this simply because they approximate the form of the dog's tooth. This is certainly a very faulty basis for a distinctive name,

inasmuch as many other animals have teeth of a very similar form, —indeed, quite as pointed as those of the dog. The word cuspid means a point, and when applied to a tooth means a pointed tooth. No other word can better designate this tooth. These teeth are also sometimes called "eye-teeth," as applied to the superior, and "stomach-teeth," as applied to the inferior. These appellations are wholly unwarranted by the forms of the teeth, or by any relation they have to the parts referred to in these names.

The FIRST PERMANENT molar is often called the "sixth-year" molar and sometimes the "six-year-old" molar, the latter being a crude expression that no one of just taste would tolerate for a moment. The ground of this nomination is the fact that this tooth is usually erupted when its possessor is about six years of age. The inappropriateness of this name is apparent from the fact that the tooth may appear at any time from five and a half to seven years of age, and in some instances even later.

The name as used would seem to indicate the age of the tooth rather than that of the possessor. There is no more propriety in thus designating these teeth than in calling the second molar the "twelfth-year" molar, or the third molar the "eighteenth-year" molar, or in naming the bicuspids according to the years of their eruption. The appellation "first permanent molar" is clear and distinct, and cannot apply to any other tooth; let this, then, be the name by which this tooth shall be designated. The third molar is known by several names. Some think it entitled to the Latin name, and hence call it "dens-sapientiæ," and others are content with the same name in English, and call it the "wisdom-tooth." The better and more distinctive name, however, is the third molar; this is clear and understandable by all, and is quite sufficient for its designation. The multiplicity of names always tends to confusion.

That part of the teeth resting in the alveolus and by which the attachment is made is denominated the "root" and the "fang." The latter name was in far more common use some years ago than now; one of these names is quite sufficient to designate this part of the tooth, and the word "root" is certainly more appropriate than the word "fang." None could be mistaken by this application of this word, while "fang" is more appropriately applied to the sharp-pointed body that protrudes from a socket or base. Nothing is gained in any respect by the use of these two words to designate that part of the tooth by which it is attached to the jaw. Let the word "root" then be adopted for this designation to the exclusion of the word "fang."

Having heard the anterior root of a lower molar defined as the mesial root, and not being able to appreciate the sense of such a definition, it is proposed here to bring before the Association the terms "mesial" and "distal," in order to get a true definition and the proper use of these terms.

MESIAL, Greek *mesos*, middle; anatomical definition ("Medical Lexicons"), an imaginary plane dividing the head, neck, and trunk into similar halves, towards right or left; every aspect towards this plane is mesial, and every aspect towards right or left is lateral, every lateral aspect being either dextral or sinistral. In the human subject the teeth are arranged around the margins of the jaws in a parabolic curve, or approximating it, and on this account special names have been applied to various surfaces with reference to front, back, or sides, in order to indicate the position occupied by the teeth and their relation to definite terms universally made use of by anatomists, to wit., median anterior and posterior. It is therefore correct to designate the approximating surfaces of the central incisors as the mesial surfaces, because the position occupied by them fulfills the concept we have, that if the median line passes between them the surface looking towards this line is the mesial surface, the labial surface representing the anterior, and the lingual the posterior surface of a central incisor. But, as before stated, the maxillary arch forms a parabolic curve; hence, it stands to reason that when this term is applied to a bicuspid the position of surfaces changes entirely—that is, if the same nomenclature is employed, the surface that was properly designated mesial in the incisors becomes an anterior surface in the bicuspid, in either the upper or lower maxillary, and what was denominated anterior and posterior in relation to the median line must now either be defined as labial and lingual; or, if you will,—carrying out the meaning of the word mesial,—designate the lingual surface as the mesial; for it is the one surface that looks towards the median line.

DENTINE.—The word dentine has been long in common use, to designate that part of the tooth constituting its body, which is found beneath the enamel and the cement. Perhaps no better term than this can be found. The word "dentos" has been suggested as a substitute for the word dentine, but why the change should be made we do not readily see. The word dentos may be appropriately used as a name for the bony covering of the dentine of the root of the tooth. This material is usually denominated the cement or cementum; both meaning the same thing, cementum

being the Latin form of the word, cement the English. This outer portion of the root of the tooth partakes much more nearly of the structural character of bone than of dentine, and may with propriety be denominated dentos. This word would be far better restricted in its application to this part of the tooth. Dr. Chase, of St. Louis, some years ago suggested the use of this name. However he may have intended, it has been used by many as designating the hard structures of the teeth and by some the dentine merely. This word is an illustration of certain cases in which it seems better to use the word of another language. The cases in which this is necessary are few and the number should be lessened whenever practicable.

TOOTH-PULP.—The soft, highly-organized body occupying the central portion of every tooth is frequently called the "nerve" of the tooth. Many of our best writers, from custom or habit rather than from a proper application of this name, have used it. It has perhaps received this nomination because of its extreme sensitiveness when exposed to external contact; but the inappropriateness of the term is apparent when we remember that only a very small part of this body constitutes the actual nerve-tissue. It is made up of a small portion of membranous and fibrous tissue, of a large amount of fluid or semi-fluid, veins and arteries, together with a small amount of nerve-tissue. There is no more propriety in denominating this body a nerve than in so designating any other highly sensitive and finely organized tissue or part of the body. The eye as a whole, for instance, may be as properly designated a nerve. The word nerve as applied to this tissue is to the student at least misleading. This structure has sometimes, very inappropriately, been called the lining membrane of the tooth, and hence some writers in former years spoke of destroying or removing the lining membrane, evidently meaning the pulp of the tooth. The word "pulp" or "tooth-pulp" is sufficiently distinctive and understandable and could not be mistaken for anything else, and would convey more nearly the idea of the structural character of the tissue. It has been suggested that the use of this name might also indicate that pulp-mass from which the tooth grows. This is readily distinguishable, however, by the word "embryo." Is it not proper and desirable therefore to designate this soft tissue as the "pulp" rather than the "nerve?"

PERIOSTEUM.—This is the usual name given to that thin layer of soft tissue immediately surrounding the root of every tooth. Some have been disposed to use the word "periodontium." For such a change we really perceive no valid reason; this tissue of course sur-

rounds the dentine, but is not in contact with it, the cement or dentos intervening, which in structure is more nearly allied to bone than the dentine, and it is in actual contact with the former and not with the latter. If the desire is to be very definite and indicate that this structure is about the teeth rather than some other bone let the qualifying word "dental" be adopted. The phrase "dental periosteum" is as easily spoken and really more distinctive and more euphonious than the word periodontium. When we spoke of an inflamed condition of this tissue in conformity with this we would say periostitis instead of periodontitis.

MECHANICAL DENTISTRY.—This phrase has long been used to designate that part of dental science and art which has to do with the manufacture and insertion of artificial teeth and all that pertains to it. So far as the needs of mechanical skill are concerned this name may be sufficiently distinctive, but it is not sufficiently extended in its reach. Some may execute well in a mechanical aspect, and yet signally fail in the production and application of substitutes for lost teeth and the restoration of adjacent parts. The name that will embrace both these ideas, namely, that of mechanism and of art, that shall enable the *application* of it to the parts here indicated, is that which should be employed, and in a search of some extent, no better term occurs for this name than "dental prosthesis." Some have been disposed to change the form of the phrase to "prosthetic dentistry." The other is a better phrase, we think. This nomination is slowly but surely making its way in the literature of our profession. It will probably be used ere long to the exclusion of the phrase "mechanical dentistry."

OPERATIVE DENTISTRY.—This name or phrase is usually employed and properly so to designate operations upon the natural teeth for their preservation, or rescuing them from the ravages of disease. It embraces operations upon and treatment of the natural teeth, and is sufficiently clear and distinctive. There has been a little disposition in some quarters to drop this name and embrace everything done in the mouth upon both the hard and soft tissues in the name of "oral surgery." This may with great propriety be applied to all operations upon the soft and hard parts in and immediately about the mouth, but the nature of the operations upon the teeth is so different from those performed upon the other parts of the mouth as to justly entitle them to a distinctive name. There is sometimes an effort made to have a name embrace too much, and this would seem to be a case of that kind.

The Section in fulfillment of the task assigned it have deemed it proper to present these few illustrations of changes which may be appropriately made in the special nomination of our profession. These are only a few to which reference may properly be made, but time would hardly permit a more extended presentation of the subject, and we fully recognize that change of language is necessarily slow. It would be a waste of time to even suggest any very great or radical change, with the hope that it would receive even brief consideration; but where there are manifest defects in our language, and especially in its nominations, which must be apparent to persons of general culture, and where names tend to confusion rather than to a clear understanding, it behooves us to do what we may to remedy such defects. The great difficulty that lies in the way of changes such as are here suggested is found, not so much in the question as to whether they are correct or not, as in the carelessness and want of attention by those who should be interested to make progress and secure the best form of distinctive literature.

SECTION III.—Continued.

Nomenclature.

PAPER BY W. H. ATKINSON, OF THE SECTION.

IN past efforts to fulfill the duty incumbent on members of this Section, it has appeared that the ambiguity of the name of the Section gave rise to misapprehension of what that duty is; in other words, it has been taken for granted that there was a "dental literature" and a "dental nomenclature" sufficiently defined to be made the subject of well-digested discussion and elucidation.

Dental literature is not good nomination for the *literature* pertaining to *teeth*. Dental nomenclature is open to a like objection. Like literature in general our text-book and journal literature is not always a truthful presentment of the degree of advancement in the knowledge considered. If I apprehend the object of forming Sections in the American Dental Association, it was to so divide the work as to get at textual statement of knowledge already attained; and to get at better methods of investigation of the underlying principles out of which to evolve matters as yet unknown.

To have science we must have the means of so arranging the parts of knowledge as to make a complete whole. Such orderly arrangement will consist of concise statements of facts. To have these *taught* they must be *repeated*. They may be repeated by word of mouth or in technicalities of written or printed statement. These last are the elements of the *literature* of the subject, in which *nomenclature* plays an important part. Both oral and written or printed texts have their use and advantage and disadvantage—that is to say, oral instructions are fresh and flexible, while written and printed texts are rigid and always the same, which is an advantage in case they are well formed and correct. But as each text can only record already attained apprehensions of the subject-matter, we are shut off from new aspects of suggestion and demonstration that are

open to those who teach under the stimulus of present surroundings and new discoveries. The literature of our specialty is in the same dilemma as that of other fields of research and execution—that is, the text-book and journal writing is in the main the product of beginners, in the enthusiasm of fresh attainments, and full of adventitious and irrelevant, not to say unripe, conclusions. The juveniles and conservative memorizers of exploded texts by far exceed in number and quantity in their contributions to text and journal literature those who give us really instructive and reliable articles.

Correct literature involves correct nomenclature, and this to be correct must adequately describe the objects which are the subjects of observation. These subjects consist of things and concepts of things and their behavior or activities; and as all the activities that come within the range of observation depend upon an illuminating impact from beyond the range of sense, it is clear that our knowledge of these is an ever-advancing series of perceptions of things and their functions, as revealed through their perceptible movements as individuals and as masses, whereby we are able to classify them and record them in the text, by the use of which we hope to save those who come after us the expenditure of some of the time, patience, and effort it has cost us to attain them.

In science, as in religion, he who attains a step in advance becomes desirous that his fellows be made to partake of that which he so highly appreciates. We may carry the analogy throughout æsthetic attainment in that portion of it where there is no commercial advantage to result from the promulgation of the new revelation. In the nature of things, that which is called science must have a career from small beginnings to higher and broader realms. Even that boastedly *exact* science called mathematics had to pass this ordeal in finding apprehension and statement by human brains, mouths, and pens, so as to pass into the printed text, for purposes of teaching inquirers the way in which they could best come to correct apprehension and rectification of the knowledge that finds genesis and expression in astronomy, cosmogony, geology, geography, natural history, anatomy, physiology, and psychology. All the foregoing are involved in and explained by the sciences of mechanics and chemistry. So that in all our investigations in acquiring and proving the facts and formulæ of literature and nomenclature, we are using excerpts of the values of the exhaustive researches of the past workers in these fields, which are held in the mind by a condensation or begrip of the whole, which spontaneously spring into demonstration when

the attention is sufficiently concentrated to afford the requisite receptivity for the revelation of truth!

A degree of mental and affectional clarity and intensity is ever the precursor of revelation to the consciousness, so that formulæ may be recorded and successfully taught. A like clarity and intensity, in kind if not in degree, are necessary to an understanding of the recorded text. So we may say, without inspiration we are utterally unable to indite, write, or comprehend the formulæ of any science or process whatsoever. When the affections are all on the *qui vive*, and the brain in high tension, demonstrations are clear, comprehensible, and satisfactory to otherwise dull listeners, even when expressed by indifferent formulæ; while the best formulæ will be rejected by the cold-blooded intellectualist, who discards *sentiment* as misleading in all matters of scientific investigation.

Sentiment is in reality the condensed essence of logic, or an unconscious holding of the values of the experiences of ancestry upon which instinct and reason are predicated. If instinct (sentiment) never misleads when free from the domination of boastful reason, may we not aver that reason is a safe guide only when not discarding or leaving out any ray of sentiment.

The science of literature (belles-lettres) involves a knowledge of all methods of record of human experiences from the earliest and simplest to the latest and most complicated and involved methods.

The simplest method is pantomime or mimicry and addresses the sense of sight only. The next is trophic or hieroglyphic and also addresses only the eye.

The third form of communicating the observations and experiences of men adds to the previous two methods that of the phonetic, which addresses the ear or the sense of hearing.

Appearances are represented in a crude way by mimicry and symbol, and sounds are produced by the voice. In the effort to recall the communications by voice, representatives or symbols of sound were invented or discovered, and these are called letters.

Letters represent single or compound sounds, and therefore stand for words and parts of words, in syllables or letters that together form the syllables of complex words, composing sentences in speech.

Repetitions, amplifications, specializations, and combinations of pantomime, picture, and speech have evolved all the languages known in literature, general and special.

In efforts heretofore made to convince this body of the inadequacy, multiplicity, incongruity, and inanity of the groupings of

effete methods of teaching, the principles and their outcrop in the laws governing functioning bodies that have stood in the way of the attainment of knowledge of the working of minds and bodies in health and disease, little appreciation has been manifest—let it be said, not on account of the perversity of those composing this noble fraternity, but by reason of a bad lead, initiated and maintained by a bad text and effete literature that has dominated all efforts to attain and to practice prophylactic and redemptive procedure in living bodies that were laboring under aberrant functional activity.

If, then, our dental literature is a diseased weakling, by reason of the dim perceptions of facts and incompetent nomenclature to record even these, shall we longer succumb to a blundering external authority of past intellections, by following the leadership of the blind, or shall we not rather assert our own right and ability to insist upon comprehending both the facts and the philosophy of which our literature is to consist; and not rest satisfied until each one can not only understand the diagnosis and proper treatment of his subjects himself, but demonstrate to others that he is in possession of the knowledge and dexterity necessary to make him successful in his professional undertakings?

To do this he must get away from the mere vaporings of dimly perceived propositions in physiology, pathology, and therapeutics, and recognize the manifoldness of the process and the complexity involved in any statement of fact or philosophy in the understanding, and record in literary perspicacity by a well-selected terminology the ever-advancing revelations in dental literature.

Dental literature is like the individual body in its advent; *i. e.*, it has an infancy, youth, maturity, and decline. No one standard of periodicity will fit all the examples we meet with in life experiences, so as definitely to fix certain ages in years as adequate limits of infancy, youth, manhood, and decline.

Some infants display the character of youth, and some youths are mature in characteristics, thus putting us at fault in our classifications in every-day life. So in like manner, some youths contribute ripe articles to our literature, while many men of mature age give us only puerile articles. To have the best literature we must have the ripest editors to select and publish it. Literary pabulum, like that for the growth and sustentation of the body, must be varied to call out the digestive power. Unvarying liturgies fail to hold the attention of the populace; so also mere repetition of old formulæ ceases to

engage the attention to the requisite degree to secure vigorous growth and research.

Dental literature, to be useful to the world, must so instruct readers as to enable them to comprehend and apply the doctrines and methods recorded in its pages. The absolutism of text-book and journal literature takes it for granted that the positions taken are impregnable and final; while everything pertaining to functional activity is in a mist so dense as to ignore the only study that can reveal the molecular metamorphosis upon which it depends. The questions put forward for settlement are such as to reveal the utter lack of perception of the points at issue—namely, "Germs or Acids —Which?" is the caption of a paper upon the "etiology of decay," thus making concomitants pose as antithets, etc., etc.

Writers and editors of our literature are divisible into two classes, each holding that it includes the other, and *vice versa*, viz., those who depend upon the mass-appearances, and those who assert that microscopic, infinitesimal bodies are the only seats of functional operations, the aggregation or massing of which are seen in the behavior of the organs, as factors of the functions of nutrition, locomotion, and intellection.

The advocates of the macroscopic side of this question grandiloquently claim to be exclusively "scientific," and point to the results of vivisections and drugging as demonstrations of their claims. The advocates of the microscopic side of the question are not content to say brain action is intellection, glands operate the secretions, and muscles the locomotion and other movements we see in the body. They say intellection is the act of a nerve-corpuscle, secretion occurs in the body of an epithelial corpuscle, and motion in the disk of the muscle. In the estimation of the macroscopist the brain, gland, and muscle are the *sine qua non* to physiology. In that of the microscopist nerve-corpuscle, epithelial body, and muscle-disk are the true workers in physiology.

And now the histologist comes in and says, "Gentlemen, you are both right from the points of view taken. But let us see if there is not a deeper insight of the subject possible to be had. Those who have studied the Protista, Protophyta, and Protozoa most sedulously acknowledge that these all arise in an amorphous solution of proteinaceous elements without visible germs. The amœba performs the acts of intellection without visible nerve-corpuscle, locomotion without muscle, and secretion and excretion without epithelia."

If, then, these infinitesimal bodies present us with all the actions of

human bodies, are we not justified in looking beyond the visible bodies for the power that is manifest in physiological movements?

Now, gentlemen, as histology owes its provable existence to visual amplification by the use of lenses, may we not indulge the hope of a like revelation in the occult region of molecular metamorphosis, whereby the production, maintenance, and replacement of tissues and elements of tissues may be demonstrated.

The current literature of physiology, pathology, and therapeutics is ambiguous, not to say dishonest. The muscles are said to move, the brain to think, and the glands to secrete; the heart to circulate the blood, the stomach to digest, etc., etc. Food, poison, and medicine are said to act on the organism. Would it not be better to say that the various functions which together constitute physiology are operated *in* the various parts where they appear, rather than *by* the *organs* in which the elaboration of function in nutrient, poisonous, or remedial manifestation takes place? When this mode of expression is urged in discussions, the reply is, "Well, everybody knows that is what is meant." It is just this sort of quasi meaning that is the point of interest and contention.

Hoping that these suggestions may find acceptance, justification by elaborate minutiæ will not be attempted now.

DISCUSSION.

Dr. CROUSE: It occurred to me that the gentleman who read the first paper hardly comprehended the province of the Section on Literature. That is to say, a report like this should not be limited to defining words and criticising the language used in our dental literature. It seems to me that the Section should present to this body a synopsis of all new works pertaining to our specialty, so that we can get an idea of the value of such books without going through so much trash as we should many times have to do, instead of dwelling on the number of journals and how many dentists take journals and how many do not. In that portion of his report I think he is in error. There are not over ten thousand dentists practicing in the United States,—from the best information we can get,—and out of the ten thousand more than one-half take at least one journal. I think one of the greatest barriers in the way of dental education is that we have too many journals for the amount of *reliable* material furnished to them. Every institution, every dental depot, every col-

lege that wants to advertise, publishes a journal, and if we do not take them they will be forced on us, and thus we have a great deal of worthless and positively injurious matter reprinted. If we could have the matter worth reading condensed into one good journal, I confess that I should read with a great deal more interest than I do. It is no wonder that dental practitioners skim over and read but little of their journals. There is a great deal in the journals which it would be better for the student not to read. The trouble I have had with young men has been to get them not to believe very much that they see in the journals. I hope that next year this Section will give us a proper report upon the literature of the profession.

Dr. ABBOTT: I am very fond of having things "boiled down." The number of dentists practicing in the United States as given by some of our dental depots, who have an interest in collecting such names, is between ten and eleven thousand. We have a depot in New York which has sent out the announcement of our college to twelve thousand seven hundred practicing dentists in America. The *Dental Cosmos* is furnished to four thousand five hundred men in America. We have eighteen other journals in this country which are taken by a great many men who do not take the *Dental Cosmos*, so I should judge that one-half the men who are practicing dentistry in this country are taking journals. I believe the demand for literature in our specialty is growing, and that the journals will do better even than they have done.

Dr. MOORE: I think the journals are doing a good work, and that their influence and circulation are extending every year. I would like Dr. Crouse to suggest some method by which the journals could be made to publish nothing but what we ought to read.

Dr. CROUSE: I was trying to get the Section to do that.

SECTION IV.

OPERATIVE DENTISTRY.

REPORT BY E. T. DARBY, CHAIRMAN.

THE Section begs leave to report that up to the present time no papers have been presented for its consideration, but the Section is strongly of the opinion that there are several subjects worthy of the consideration of this Association, and it would therefore suggest that the following subjects be discussed under the head of Section IV.:

1st. "Treatment of Children's Teeth and the best Material or Materials with which to fill Young or Uncalcified Teeth."

2d. "The Use of Textile Metals, and the Combination of Tin and Gold; also, the Combination of Gold and Amalgam in the same Cavity."

3d. "Irregularities of the Teeth, and the Methods employed for Correction,"—the discussion upon this subject to be opened by Dr. Keely.

DISCUSSION.

Dr. TAFT: There is considerable diversity of opinion and practice with reference to the management of the temporary teeth. I regard this as a very important subject. I know that in the minds of the people there is a great want of appreciation of the value of these teeth, and of the importance of their care, and I apprehend that in the minds of the dental profession there is a want of appreciation as well, and hence many of this class of teeth are permitted to become badly diseased. They ought to be preserved in a state of health during the time they remain in the mouth, and whatever can be done to secure this end should not be omitted. We often see the teeth of children who have been under the care of dentists grossly neglected, and in a condition of uncleanliness that teeth ought never to show. Temporary teeth are often so decayed and diseased as

to prevent their proper use in mastication, causing great inconvenience and embarrassment; but that is not the most serious consequence to be feared. The influence of such conditions upon the germs of the permanent teeth almost certainly results in imperfectly formed or developed teeth. Parents and guardians should fully realize that they ought to be cared for, kept thoroughly clean, be well used in mastication, and upon such food as will keep them properly exercised. When they become decayed it is important that they should be promptly looked after, so that incipient decay may be removed, or cavities already formed be filled before such operations would be too late. In the filling of these teeth a temporary material may be used. Hill's stopping, gutta-percha, or oxyphosphate of zinc, etc., etc., will serve the purpose. Every one knows that it is a very serious matter to attempt a prolonged and difficult operation upon the temporary teeth of young children, and so the necessity of the case seems to require that something that can be readily applied in a very brief time shall be employed. Happily for the patient these things are at hand.

Dr. HORTON: In the treatment of the temporary teeth much trouble arises from the fact that the people are not properly instructed regarding the necessity of their care and preservation. They are of the opinion that these teeth are of short duration, and that they can be removed without detriment if they cause annoyance or irritation, as they will be replaced by the permanent set in a very short time.

Within the last two or three years a physician in whose family I have practiced for a long time sent to me his little boy, about six years old, with the pulps of the first inferior temporary molars exposed, with the order to have them extracted. The first inferior permanent molars were decayed at the time they were erupted, and before the boy was six years old the crowns had almost entirely disappeared and abscesses had formed at the root of each. This created such an irritation that it was necessary to extract them; so when the boy came to me with the pulps of the temporary teeth exposed, I sent for his father and demonstrated to him that the boy would have nothing to masticate his food with for five or six years, if those two teeth were extracted as he desired. He told me to do as I thought best. I put the rubber dam upon those two teeth and very carefully cleaned them as well as I could without puncturing the exposed pulps. I then prepared some oxyphosphate of zinc about as thick as cream and dropped on each of the live pulps. Letting that harden

I mixed some more a little thicker and let that harden also, and then with great care completed the fillings with amalgam. That was done three years ago last summer. A few weeks ago I saw the case, and I am certain that those pulps were alive and well, and the circulation as complete as before they were exposed.

That is the treatment I give,—in a modified form,—to temporary teeth in such cases. These teeth should never be extracted as long as there is vitality, because the absorption of the roots of the temporary teeth is a vital process. Whenever a tooth becomes devitalized from any cause this vital action ceases.

A few months since I extracted six roots of temporary teeth that were in a very good state of preservation from around the upper bicuspids of a young lady twenty-six years old. You all know those roots should have been removed at ten or twelve years of age, by nature's operations. They remained at least fourteen years beyond the time they were of any use, simply because there was no attention paid to the condition of the mouth by the patient, or the dentist, if she had one.

There are but few cases in which I would remove temporary teeth. One is where there is trouble that is causing the death of the pulp, and great irritation or inflammation follows. Another is where the permanent teeth are erupted and there is no possibility of the absorption of the roots.

Dr. WATKINS: I have a case of a young lady, nineteen years of age, who has not lost the second temporary molars, which seem to be firm in the jaw. They are not decayed, and there seems to be no sign of the bicuspids coming. I would like to ask Dr. Horton what he would do in that case?

Dr. HORTON: If there is no evidence of the permanent tooth coming, leave the temporary tooth there. Perhaps the germ of the permanent tooth is wanting. I recollect one family that have no upper bicuspids at all, and their temporary teeth are to-day in the mouth, and some of the family have reached mature age.

Dr. WATKINS: Do you not think that nature has already supplied the germs of the permanent teeth, and that the irritation caused by the removal of the temporary ones would stimulate nature to do its duty, and that the appearance of the missing teeth would soon follow.

Dr. HORTON: If there is no evidence of it I would let the temporary tooth remain.

Dr. RHEIN: I differ somewhat from the doctor in regard to this

matter. I had a case very much like the one to which Dr. Watkins has referred. A gentleman, aged about twenty-three, came to me a few months ago complaining very much of a swelling in the neighborhood of what would be the first permanent molar on the right side. The parts around the tooth were very much swollen. He told me he had had trouble of the same nature about this time every year for the three years last past, and he had gone to different dentists on each occasion and they had given him relief. It was impossible to make a thorough examination because of the inflammation. I treated the mouth to reduce the inflammation and told him to return the following day, and when he appeared, with a burnisher introduced around the tooth, I found it was his temporary second molar which was causing the trouble. I extracted the tooth at once, and found the roots entirely absorbed and the second bicuspid immediately underneath the gum. I have not seen the patient since, but I feel almost positive that the bicuspid will not come into proper position, from the view I obtained of it. I have seen a number of cases in which the second bicuspid has been erupted in a very irregular position—that is to say, the buccal surface of the tooth has been turned around to the approximal side, in one way or another. This is generally due to the fact that the second temporary molar has been allowed to remain too long in the mouth. The second temporary molar seems, in some manner, even after the roots have been thoroughly absorbed, to be held in place in the jaw very firmly. In the case I have described nature had for the last four years attempted to throw off this tooth but did not succeed, because the crown, the roots being absorbed, was wedged in between the first bicuspid and first molar. The same patient has a very irregular condition of his teeth generally. He has always been under dental treatment, and his four temporary canines,—merely because the dentist did not believe in extracting the temporary teeth,—were allowed to remain, and the consequence is that with the possession of eight canines and the lack of a number of posterior teeth, a worse condition of affairs could hardly exist than is to be found in his mouth.

I have in my mind a patient in whose mouth the second temporary molar was allowed to remain until she was about eighteen, and in consequence the second bicuspid made its appearance with the buccal surface turned toward the posterior approximal side of the first. I think a great deal of harm is done by allowing the temporary teeth to remain in the mouth too long.

Dr. WATKINS: There has been nothing said with regard to the

treatment of children's teeth where the pulps are dead or the teeth abscessed. In the treatment of such teeth I find a preparation of iodoform an excellent thing. I use a prescription which Dr. Bödecker copied from the German and gave to the New York Odontological Society about a year ago. I apply this preparation in the pulp-chamber after removing all decay, and then fill the tooth with some one of the soft fillings, and I have yet to see the first case where any inflammation has followed after the tooth has been filled. I have been using this preparation about a year, and while, previous to that time, by pursuing the methods recommended by many dentists, in many cases I failed, since I have been using this preparation I have not had a single failure. I have also used the same preparation in covering the pulps of temporary teeth where they have been exposed, filling directly over the remedy at the same sitting, and in such cases I have not had a single failure. I find there are a great many dentists who have not used it and I would recommend it to them.

Speaking of children's teeth, I have under my care a child (?) about forty-five years of age, weighing about two hundred pounds, and she has not got her wisdom-teeth. She has a perfect set of teeth otherwise, in number twenty-eight, and there is no sign of the wisdom-teeth and never has been. She has never had any of her permanent teeth extracted. She is troubled with a great deal of neuralgia, and I would like to ask if it is possible that the wisdom-teeth are giving her this trouble, and if removing the second permanent molars would give the wisdom-teeth a chance to erupt and cure that trouble, or if it is too late in life for that.

Dr. STOCKTON: Not long since a lady of about sixty years of age presented herself at my office for consultation, and gave me the following history of her case: A short time before she discovered in the roof of her mouth something that did not belong there. She called the attention of her physician to it, who examined it very carefully and said: "You have a case of necrosis; your jaw is very much diseased, and you will have to have an operation performed." An eminent physician from the City of New York was also consulted, and he pronounced it as the local medical man had done a case of necrosis, and they decided to perform an operation. The patient was very nervous and would not consent at that time, and another appointment was made; but the old lady could not make up her mind to submit to the operation and sent the doctors home.

She asked me to look at her mouth. I did so, and told her that

the necrosis could be cured in half a minute. I extracted a cuspid tooth that had been lying dormant for years, but had recently erupted in consequence of the pressure, I presume, from a rubber plate that she had been wearing. Her necrosis was cured, and she naturally was greatly delighted and went home rejoicing.

Another case I would like to report. A very prominent gentleman in our city had a pulpless wisdom-tooth, which had remained in his mouth in that condition twelve or fifteen years. It finally gave him trouble, and I removed it. The inflammation did not subside, ulceration ensued, and during my treatment the family became very nervous and sent for the family physician, who insisted upon the patient applying warm poultices. The patient was a very large, fleshy gentleman, and his throat was almost closed by the inflammation. In order to quiet the nerves of the family I sent for my friend, Dr. Atkinson. I did not tell him what I had done, knowing that he knew what was right always.

Very much to my rejoicing and to the great satisfaction of the patient and the family he confirmed my treatment, and said, "Don't you apply anything warm, but use ice," as I had advised. If the treatment which the physician advised had been continued, I have no doubt from the temperament and organization of the patient that he would not be alive to-day. The case resulted all right, and the gentleman is well and has gone to Europe.

Dr. BUCKINGHAM: I do not see that we are getting very much information in regard to the treatment of children's teeth. We should consider not so much the extraordinary cases that present themselves and sometimes require extraordinary treatment, but those that generally and constantly require our care. If the temporary teeth are badly decayed, what shall we do?

Shall we destroy the pulps and fill the teeth, or shall we extract them? If we extract, what harm will be done? Will extraction cause the permanent teeth to be irregular? That is a question that has not yet been decided, and one of very considerable importance. Again, if we conclude to treat the teeth and fill them, what is the best treatment we can give? Shall we destroy the pulp with arsenious acid, or shall we use some other medicine that will effect the same result? We must bear in mind that the whole structure of the temporary teeth is much less dense than the structure of the permanent teeth, and for that reason we have to use a more gentle means to produce the effect.

I have no doubt that iodoform will answer in very many cases.

The composition of that is the same as chloroform, with the addition of iodine in the preparation. I have no doubt that you could get the same effect if you would use the tincture of iodine in combination with chloroform. The iodoform answers the purpose better from being already combined and easily broken up by the action of fluids.

Again, some preparations of zinc are probably best to put in the bottom of cavities when the cavities are large. We have no solid that is more congenial to an irritated surface than oxide of zinc. Mixed with creasote it will form a more perfect covering over a wounded pulp than any other substance you can get.

Dr. S. G. PERRY: I take great delight in the care of children's teeth. I commence very early and urge upon parents the need of great care and constant watchfulness. I do not think I ever filled a temporary tooth with gold in my life. I use tin-foil, oxyphosphate, gutta-percha, and sometimes amalgam. To the permanent teeth, from the time of their eruption, I give the closest attention. I never allow a fissure that shows the slightest sign of softening to go unfilled. Many of those in the grinding surfaces I cut out and fill before the teeth have fairly erupted, because I recognize that the most dangerous period is the first few months after the teeth have broken through the gum. At this time they are often covered by portions of the gum, which cause a sheltered condition conducive to rapid decay in the imperfectly calcified fissures. With soft teeth and a destructive condition of the fluids of the mouth, I often lift the flaps of gum and fill the fissures under them with such materials as I can best use. I rarely use gold, preferring tin or oxyphosphate for such operations.

Every fissure into which I can pass my finest examining point I cut out with delicate instruments or the very finest burs. Under certain conditions I follow the fissures to their extremities, even if they have not already softened, for if this is not done I know that in a few years a second operation will be needed.

Before ten years of age I fill many cavities in the grinding surfaces of permanent teeth with the oxyphosphate of zinc, covering it at once with sandarac varnish. In the grinding surface fissures it sometimes lasts astonishingly. If the teeth are not sufficiently erupted to articulate with the opposing teeth, these fissures can be filled very full, thus allowing for wear. Cavities filled with tin or oxyphosphate at twelve years of age can be kept small, and, the borders being allowed to calcify, smaller fillings can be made at

twenty years of age than if the same cavities had been filled with gold at twelve. At this age the teeth are so soft that they must be cut away considerably to get sufficiently firm borders to receive gold, whereas we all know that the softened part of a cavity need not be all cut out in order to save the tooth with oxyphosphate or with tin, and we also know that in time the softened borders of the cavity become calcified—sometimes, in fact, even recalcified when decay had actually commenced. Therefore I watch the fissures very closely in young teeth, and endeavor to keep the fillings in them as small as possible. Before ten years of age I use tin or oxyphosphate quite largely. I can do this with safety, because most of my little patients are sent frequently for regular attention.

Whenever I find teeth of good quality and a manageable child, so that I can easily make a permanent operation, I use gold without regard to age. In the front teeth I use oxyphosphate and gutta-percha a great deal before even fifteen years of age. Before that age I sometimes use tin in the front teeth, though I prefer to put it in cavities exposed to attrition, for I have observed that in sheltered places it does not keep bright, but becomes oxidized and softened.

Dr. CROUSE: I have nothing particularly new to offer except to indorse largely what Dr. Perry has said as to the filling of the first permanent teeth of children. I cut out the fissures and fill them with some preparation that will protect them for three or four years, or until they can be filled permanently. If the child is one whose teeth I can fill thoroughly without taxing it too much, and the tooth is well organized, I should fill it with gold.

Many times temporary teeth hold in their cavities agents that will destroy the permanent teeth in close and constant contact with them, and in such cases I should cut the temporary teeth away sufficiently to prevent their injuring the permanent teeth. They are particularly the source of injury to the first permanent molar and the lateral incisor. I should cut away the temporary cuspid freely, so that it could be easily kept clean, as a preventive treatment. I find a great many fissures in the teeth where a slight drilling and a small filling will stop the progress of decay and prevent what would later be a large cavity. This I call preventive treatment.

The most important thing is to get our patients to take care of their teeth. There are a great many parents who will take care of their children's teeth if you give them proper instructions, and who will train the children so that by the time they are ten or twelve years of age they will do that part of their duty thoroughly. This

instruction of parents is what I am particular about in my practice. I think we can do more good in that way than in any other.

Dr. PEIRCE: I want to call attention to a method of preserving the teeth upon which I have the credit of being a little deranged. We are all aware that American people usually at their meals drink freely of milk, tea, coffee, or water. It is very customary for children during meal-time to drink one, two or three glasses of milk, or water, or tea, or coffee with their more solid food, and in this way they take the food into the stomach without proper mastication.

I have under my care three families of children, and through the interest manifested by their parents they have been instructed to refrain from drinking except before and after meals, so that the food is taken into the mouth and masticated in a comparatively dry condition. I am satisfied that since these families have adopted this method the teeth have improved from their additional use in the mastication of dry food. They have also been improved from the better condition of the stomach and nutrition. I am also satisfied that an important factor in the decay of teeth is the lack of proper use and the want of proper nourishment. Both of these are largely facilitated by the absence of fluids during the period of mastication.

Dr. HARLAN: I wish to call your attention to a new method of bleaching teeth, and first will say that I think no escharotic, or acid, or alcohol, or anything of that nature should be introduced into the cavity before bleaching. The rubber dam having been applied the root-canal should be filled from the apex down about one-third of its length. All decay should be removed, but it is not necessary that all discolored dentine should be. The cavity should then be washed with water, or, as I prefer, with peroxide of hydrogen, and well dried, when it is ready for bleaching.

The agent I now use for this purpose is chloride of alumina, the formula of which is $Al_2Cl_6,12H_2O$. It is a yellowish-looking, granular, crystalline substance. It is placed in the cavity dry, and a drop or two of water added, when it it is immediately deliquesced and the discoloration is readily attacked and destroyed by the chlorine which is immediately liberated. If the discoloration should depend upon the micrococcus prodigiosus, which produces the reddish tinge, it is destroyed at once. One thing should be kept in mind, and that is, that hydrochloric acid is formed within the cavity, which should be neutralized with bicarbonate of soda or some other preparation of that kind, and then the interior of the tooth may be filled with any of the oxychlorides.

You should never permit moisture of the mouth to get into the cavity after the oxychloride has been introduced. The cavity should be hermetically sealed after the lining of oxychloride is introduced. If any of you will try this method of bleaching, you will be astonished at the results.

Dr. V. H. JACKSON: I would like to ask the doctor if the teeth are inclined to return to their original dark color as in other cases?

Dr. HARLAN: In those cases that have stood longer than a year there has been no tendency to a rediscoloration of the teeth.

Dr. CALLAHAN: I have been waiting for some older persons than myself to answer the question of Dr. Watkins in reference to extracting the wisdom-teeth.

I had a case of a lady about thirty-five years of age, where I extracted the molar, and in about ten days afterwards the wisdom-tooth made its appearance.

Dr. V. H. JACKSON: I had a patient who had been under a physician's care for neuralgia for about a year and a half. It was such an aggravated case that the lightest touch of his moustache would cause the most violent disturbance. The physician had used all methods known to him to relieve the patient of neuralgia, and had treated him both systemically and locally, and also for malaria. He was finally sent to me by the physician to see if there was anything about the teeth that could be the cause of the trouble. I found that one tooth was slightly sensitive to the rap of a metal instrument while the rest of them did not seem to be at all sensitive. I finally, on March 5, extracted the tooth, which was living, and found exostosis at the apex of the root. I was very anxious to save the tooth and I filled the end of the root and the pulp-canal, the crown having already been filled, and reset it.

The gentleman did not have any more neuralgia for about three months. His physician sent me word that I had done more for him in that one operation than he had been able to do in a year and a half of treatment; but on July 7 the gentleman appeared in my office again, and said he had another tooth which ought to be extracted and reset. I examined his mouth very carefully but did not find any symptoms which I thought would justify me in performing a similar operation to the one before made. I counseled with his physician, and told him if he had not tried electricity I should like to have him do so. The patient has not received any benefit as yet from the application of electricity.

I would like to hear from the gentlemen of the Association if they

know of any similar case, and what they can suggest on the subject.

[The following note was received just before going to press, and is inserted here as of peculiar interest.—PUB. COM.]

NEW YORK, Nov. 12, 1888.

THE above case was benefited by constant use of electricity at the hands of an experienced electrician, Dr. Rockwell, and continued to improve till about Oct. 18, when the neuralgia returned with renewed vigor, but was on the other side of the face at this time. The patient wanted the first molar extracted, but finding by careful examination, Oct. 18, that the wisdom-tooth was tender upon the rap of an instrument I extracted that. The patient was instantly relieved and has remained so till this date. There was a slight exostosis at the apex of the root, only not so marked as before.

Dr. ATKINSON: I would like to ask if the tooth which was exostosed had an antagonist?

Dr. JACKSON: The arch was perfect with the exception of one wisdom-tooth.

Dr. ATKINSON: Then the cure is to tie his mouth together at night so that he cannot sleep with it open.

Dr. S. G. PERRY: Let me mention here that for years I have had a great deal of satisfaction in filling very large cavities with amalgam, and after it has crystallized cutting a narrow groove around the margins and filling with gold. With large approximal fillings which run under the gum this can be done only down to the gum margin, but I never look for early failure of amalgam fillings under the gum if they have been carefully finished there. According to my experience such large fillings fail first by the crumbling of the grinding surface borders. By anticipating this crumbling and filling with a narrow band of gold around the margins, permanent operations may be made. Of course, this is not to be done in cavities where gold can be used throughout, but in those large ones where it is desirable to restore the contour with a plastic material.

In this connection I will mention that I sometimes restore crowns upon the roots of the posterior molars by fitting around them a thin band of platinum, which I make as wide as the crown should be long when completed. Having dove-tailed the roots carefully I fill them and the band with amalgam, articulating the opposing tooth upon the amalgam while it is yet soft. The operation is a simple one, and very quickly and easily performed. The band having been fitted around the roots in the mouth and marked, can be soldered with gold in a moment at the chair, and the whole operation com-

pleted without help from the laboratory. Such crowns make very safe and strong masticators. Of course, they are permissible only when they can be kept out of sight.

Dr. MARCKLEIN: We can hardly be too careful not to drive any material under the free margin of the gum. It is always an irritant to some extent. I have seen considerable of this irritation caused by the so-called Richmond crowns. I have seen a great deal of Dr. Richmond's own work, and also that of others, and I have almost always found that the gold extending under the free margin of the gum has been a very great irritant. The gum at the alveolar border has been absorbed, decay has recurred above the crowns, and the crowns have had to be removed. I have used the method that Dr. Perry has just described, and I think it answers fully as well as any other that I have seen.

Dr. PRIEST: There are many cases which require gentle treatment; such as feeble, aged, and infirm patients, children, and women during pregnancy and after child-birth. Successful operations may be made by filling the base of many approximal cavities with amalgam, mixed to harden quickly, and then gently packing the gold upon it. The amalgam will soon admit of sufficient pressure or malleting to pack the gold perfectly and make a permanent filling; thus saving the patient from great nervous strain, which sometimes prevents people from submitting to the torture of having teeth filled, they preferring to have them extracted. Many cavities may be lined with oxyphosphate cement and completed with gold with the best results,—giving great relief to the patient during and comfort after the operations.

Dr. WATKINS: A year ago I was in Dr. Baker's office in Boston, and he described to me the method which he used for making fillings of amalgam and gold combined by applying thin copper bands such as Dr. Barrett described yesterday, around teeth where there were large approximal cavities in the bicuspids and molars. He then mixed his amalgam filling as dry as possible, packing it very hard into the bottom of the cavity, half-filling the cavity, and then removing all the upper part of the filling, which has the excess of mercury in it. He then immediately puts the gold in. The first few pieces of gold will be bedded into the amalgam, and after that he can build the gold without changing the amalgam at all, and complete the filling at the same sitting without having to wait for the amalgam to set.

In finishing the filling it is very easy to trim the amalgam around

the cervical wall. In filling in that way we may be positive that the entire cavity is filled to the walls, while in using gold exclusively in such cavities it would be very difficult to have such assurance.

I have used that method for a year, and find it a very useful one. Frequently in filling large cavities in molars I use oxyphosphate of zinc to half-fill the cavity, where I can cover it up so that moisture will not get to it, and then complete the operation with gold. I have used Dr. Robinson's material to a limited extent, and find that it works very nicely in just such cavities as I have described. It can be carried to the cervical wall and molded around all the walls very easily. Cavities can also be filled almost full, leaving the thinness of a piece of paper on the outer surface to be covered with gold. I have only used it for about six months, but it appears to do well.

TRANSACTIONS

OF THE

AMERICAN DENTAL ASSOCIATION

AT THE

TWENTY-FOURTH ANNUAL SESSION,

HELD AT SARATOGA SPRINGS,

COMMENCING ON THE 7TH OF AUGUST, 1884.

PUBLICATION COMMITTEE:

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PRESS OF PATTERSON & WHITE,
PHILADELPHIA.

LIST OF OFFICERS FROM DATE OF ORGANIZATION.

PRELIMINARY CONVENTION, NIAGARA FALLS, AUGUST, 1859.

President,	W. W. ALLPORT . . .	Chicago.
Secretary,	J. TAFT	Cincinnati.

ORGANIZATION AND FIRST SESSION OF ASSOCIATION, WASHINGTON, D. C., JULY, 1860.

[Annual meetings to be hereafter last Tuesday in July.]

President,	W. H. ATKINSON . . .	Cleveland.
1st Vice-President,	J. B. GIBBS	Washington, D. C.
2d Vice-President,	W. CAHOON	Detroit, Mich.
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Corresponding Secretary,	W. MUIR ROGERS . . .	Shelbyville, Ky.
Treasurer,	S. DILLINGHAM . . .	Philadelphia.

[NO MEETING IN 1861.]

CLEVELAND, JULY, 1862.

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2d Vice-President,	W. D. STONE . . .	Lexington, Ky.
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PHILADELPHIA, JULY, 1863.

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2d Vice-President,	WM. B. HURD . . .	Brooklyn, N. Y.
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Corresponding Secretary,	C. R. BUTLER . . .	Cleveland.
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NIAGARA FALLS, JULY, 1864.

President,	J. H. MCQUILLEN . . .	Philadelphia.
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2d Vice-President,	H. BENEDICT	Detroit.
Recording Secretary,	J. TAFT	Cincinnati.
Corresponding Secretary,	GEO. W. ELLIS . . .	Philadelphia
Treasurer,	I. J. WETHERBEE . . .	Boston.

CHICAGO, JULY, 1865.

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2d Vice-President,	JAS. MCMANUS . . .	Hartford.
Recording Secretary,	J. TAFT	Cincinnati.
Corresponding Secretary,	L. D. SHEPARD . . .	Boston.
Treasurer,	I. J. WETHERBEE . . .	Boston.

BOSTON, JULY, 1866.

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1st Vice-President,	W. H. MORGAN . . .	Nashville.
2d Vice-President,	L. D. SHEPARD . . .	Boston.
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Corresponding Secretary,	A. HILL	Norwalk, Conn.
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President,	JONATHAN TAFT . . .	Cincinnati.
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Treasurer,	W. H. GODDARD . . .	Louisville.

SARATOGA SPRINGS, AUGUST, 1869.*

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Recording Secretary,	M. S. DEAN	Chicago.
Corresponding Secretary,	I. A. SALMON . . .	Boston.
Treasurer,	W. H. GODDARD . .	Louisville.

* Owing to a change in the Constitution, officers elected at this and the sessions following served at the next annual meeting subsequent to their election; and the sessions of and after 1869 commenced on the first Tuesday in August.

NASHVILLE, AUGUST, 1870.

President,	W. H. MORGAN	Nashville.
1st Vice-President,	S. W. DENNIS	San Francisco.
2d Vice-President,	J. R. WALKER	New Orleans.
Recording Secretary,	M. S. DEAN	Chicago.
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Treasurer,	W. H. GODDARD	Louisville.

WHITE SULPHUR SPRINGS, VA., AUGUST, 1871.

President,	GEO. H. CUSHING	Chicago.
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2d Vice-President,	J. R. WALKER	New Orleans.
Recording Secretary,	M. S. DEAN	Chicago.
Corresponding Secretary,	I. A. SALMON	Boston.
Treasurer,	W. H. GODDARD	Louisville.

NIAGARA FALLS, AUGUST, 1872.

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2d Vice-President,	G. A. MILLS	Brooklyn, N. Y.
Recording Secretary,	M. S. DEAN	Chicago.
Corresponding Secretary,	J. TAFT	Cincinnati.
Treasurer,	W. H. GODDARD	Louisville.

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DETROIT, AUGUST, 1874.

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NIAGARA FALLS, AUGUST, 1875.

President,	A. L. NORTHROP	New York City.
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2d Vice-President,	H. A. SMITH	Cincinnati.
Recording Secretary,	C. STODDARD SMITH	Springfield, Ill.
Corresponding Secretary,	J. H. MCQUILLEN	Philadelphia.
Treasurer,	W. H. GODDARD	Louisville.

PHILADELPHIA, AUGUST, 1876.

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1st Vice-President,	C. N. PEIRCE . . .	Philadelphia.
2d Vice-President,	CORYDON PALMER . .	New York City.
Recording Secretary,	C. STODDARD SMITH . .	Springfield, Ill.
Corresponding Secretary,	J. H. MCQUILLEN . .	Philadelphia.
Treasurer,	W. H. GODDARD . . .	Louisville.

CHICAGO, AUGUST, 1877.

President,	F. H. REHWINKEL . .	Chillicothe, Ohio.
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2d Vice-President,	GEO. T. BARKER . . .	Philadelphia.
Recording Secretary,	M. S. DEAN	Chicago.
Corresponding Secretary,	M. H. WEBB	Lancaster, Pa.
Treasurer,	W. H. GODDARD . . .	Louisville.

NIAGARA FALLS, AUGUST, 1878.

President,	H. J. MCKELLOPS . .	St. Louis.
1st Vice-President,	L. D. SHEPARD . . .	Boston.
2d Vice-President,	L. D. CARPENTER . . .	Atlanta, Ga.
Recording Secretary,	GEO. H. CUSHING . . .	Chicago.
Corresponding Secretary,	A. O. RAWLS . . .	Lexington, Ky.
Treasurer,	W. H. GODDARD . . .	Louisville.

NIAGARA FALLS, AUGUST, 1879.

President,	L. D. SHEPARD . . .	Boston.
1st Vice-President,	C. N. PEIRCE . . .	Philadelphia.
2d Vice-President,	GEO. L. FIELD . . .	Detroit.
Recording Secretary,	GEO. H. CUSHING . . .	Chicago.
Corresponding Secretary,	M. H. WEBB . . .	Lancaster, Pa.
Treasurer,	W. H. GODDARD . . .	Louisville.

BOSTON, AUGUST, 1880.

President,	C. N. PEIRCE . . .	Philadelphia.
1st Vice-President,	W. C. BARRETT . . .	Buffalo.
2d Vice-President,	GEO. J. FRIEDRICHS . .	New Orleans.
Recording Secretary,	GEO. H. CUSHING . . .	Chicago.
Corresponding Secretary,	A. M. DUDLEY . . .	Salem, Mass.
Treasurer,	W. H. GODDARD . . .	Louisville.

NEW YORK, JULY, 1881.

President,	H. A. SMITH	Cincinnati.
1st Vice-President,	W. C. BARRETT . . .	Buffalo.
2d Vice-President,	GEO. J. FRIEDRICHS . .	New Orleans.
Recording Secretary,	GEO. H. CUSHING . .	Chicago.
Corresponding Secretary,	A. M. DUDLEY . . .	Salem, Mass.
Treasurer,	W. H. GODDARD . . .	Louisville.

CINCINNATI, AUGUST, 1882.

President,	W. H. GODDARD . . .	Louisville.
1st Vice-President,	GEO. J. FRIEDRICHS . .	New Orleans.
2d Vice-President,	E. T. DARBY . . .	Philadelphia.
Recording Secretary,	GEO. H. CUSHING . . .	Chicago.
Corresponding Secretary,	A. W. HARLAN . . .	Chicago.
Treasurer,	GEO. W. KEELY . . .	Oxford, Ohio.

NIAGARA FALLS, AUGUST, 1883.

President,	E. T. DARBY . . .	Philadelphia.
1st Vice-President,	C. S. STOCKTON . . .	Newark, N. J.
2d Vice-President,	T. T. MOORE . . .	Columbia, S. C.
Recording Secretary,	GEO. H. CUSHING . . .	Chicago.
Corresponding Secretary,	A. W. HARLAN . . .	Chicago.
Treasurer,	GEO. W. KEELY . . .	Oxford, Ohio.

SARATOGA SPRINGS, AUGUST, 1884.

President,	J. N. CROUSE . . .	Chicago.
1st Vice-President,	M. W. FOSTER . . .	Baltimore.
2d Vice-President,	C. F. RICH . . .	Saratoga.
Recording Secretary,	GEO. H. CUSHING . . .	Chicago.
Corresponding Secretary,	A. W. HARLAN . . .	Chicago.
Treasurer,	GEO. W. KEELY . . .	Oxford, Ohio.

EXECUTIVE COMMITTEE FOR SESSION OF 1885.

C. N. PEIRCE, Chairman. A. M. DUDLEY, Secretary.

FIRST DIVISION—COMMITTEE OF ARRANGEMENTS.

*J. N. CROUSE, *GEORGE L. FIELD, W. N. MORRISON.

SECOND DIVISION—ON CREDENTIALS, ETHICS, AND AUDITING ACCOUNTS.

*A. M. DUDLEY, S. G. PERRY, A. O. HUNT.

THIRD DIVISION—ON VOLUNTARY ESSAYS.

C. N. PEIRCE, L. D. SHEPARD, GEO. J. FRIEDRICHS.

LOCAL COMMITTEE OF ARRANGEMENTS.

A. T. SMITH, of Minneapolis; F. H. GARDINER, Chicago; and H. J. MCKELLOPS, St. Louis.

* These go out August, 1885.

CONTENTS.

	PAGE
Disclaimer	2
Officers from date of organization	3–7
Amended Constitution	13–28
Roll-call	29–33
Report of Programme	33
Time fixed for Clinics	33
Credentials, report on, by Executive Committee	33
Amendments to Constitution adopted	34, 40
Motion to appoint Committee on the death of Dr. Buckingham	34
Motion to appoint Committee to suggest means of increasing attendance	34
Publication Committee's Report	34
President's Address referred to Committee	35
Sections—time of meeting	35
Time set for hearing Dr. Williams's paper	35
Section VI. called	35
Motion to draw necessary orders on Treasurer	36
Executive Committee, filling vacancies on	36
Courtesies of the floor extended to gentlemen not members of the Association	36
Telegram received from Dr. T. T. Moore	36
Section VII. called	36
Sections organized	36
Dr. Williams's paper and Stereopticon Exhibition	37
Accident to child of Dr. Clifton announced	37
Local Committee of Arrangements instructed to endeavor to bring author of accident to justice	38
Committee instructed to secure nurses for Dr. Clifton's child	38
Report of Committee on death of Dr. Buckingham received and action thereon	38
Extract from a letter from Dr. Bödecker read	38
Dr. F. Y. Clark reinstated as a member	38
Dr. Crowell invited to state views and plans of the Dental Protective Union	39
Report from the president of the village of Saratoga in regard to Dr. Clifton's child	39
Section I. called	39
Section II. called	39
Resolutions offered by Section on Education adopted	39
Report of Committee of condition of Doctor Clifton's child	40
Report of Committee on President's Address	40

PAGE

Section III. called 40
Chairman of Section III. instructed 40
Section IV. called 40
Place of next meeting selected 41
Election of Officers 41
Treasurer instructed to honor draft of Dr. Clifton 41
Dr. Allport's personal explanation 41
Credentials Committee's final report adopted 41
Treasurer's Report 41
Executive Committee's Report auditing the Treasurer's and Publication Committee's accounts adopted 42
Thanks tendered to Mr. Clair of the Grand Union 42
Thanks tendered to various railroads 43
Thanks tendered to Local Committee of Arrangements 43
Installation of Officers 43
Communication from New Jersey State Dental Society 43
Publication Committee appointed 43
Local Committee of Arrangements appointed 43
Section V. called 43
Reading of minutes and adjournment 43
Memorial Pages 44–46

REPORTS AND VOLUNTEER PAPERS.

President's Address 47

Section VI.

Supplemental Report on Treatment of Pyorrhœa Alveolaris, by A. W. Harlan, Chairman 55

Section VII.

Report on Physiology and Etiology, by W. C. Barrett, Chairman . . 88

Section I.

Report by W. H. Trueman, Chairman 115
Paper on Artificial Dentistry, by John Allen 119
Paper entitled "Who are Dentists?" by J. A. Robinson 122

Section II.

Report by C. N. Peirce, Chairman 130

Section III.

Report on Dental Literature, by J. Taft, Chairman 143

Section IV.

Report by Edwin T. Darby, Chairman. 150

SECTION V.

PAGE

Paper on Certain Disputed Points in the Development and Histology of the Teeth, by J. L. Williams 158

DISCUSSIONS.

SECTION VI.

Pyorrhœa Alveolaris—discussed by

Dr. Odell 61, 72
Dr. Bogue 62, 63
Dr. Harlan 62, 63, 81
Dr. Barrett 63, 65, 66
Dr. Atkinson 65, 66, 84
Dr. Shepard 68, 76, 83
Dr. Peirce 69, 73, 79
Dr. Rhein 71
Dr. Field 71
Dr. Allport 73
Dr. Jas. Truman 74
Dr. Searle 76, 79
Dr. Stockton 78
Dr. R. Finley Hunt 78
Dr. Watkins 80
Dr. How 81
Dr. E. Parmly Brown 83
Dr. F. Y. Clark 110

SECTION VII.

Micro-Organisms as the Cause of Caries—discussed by

Dr. Spalding 95, 100
Dr. Barrett 95, 100, 107, 113, 114
Prof. Mayr 96
Dr. Atkinson 96, 97, 104, 107
Dr. Abbott 102
Dr. Peirce 105, 107, 108
Dr. Searle 108, 112, 113
Dr. F. Y. Clark 108, 111, 112
Dr. Daboll 110, 111, 112, 113
Dr. Friedrichs 111, 112
Dr. Shepard 113
The President 114
Dr. R. Finley Hunt 114

SECTION I.

No discussion.

SECTION II.

Dental Education—discussed by

Dr. Spalding 134, 135, 137, 138, 139
Dr. Peirce 134, 135
Dr. R. Finley Hunt 135

PAGE

Dr. Friedrichs 136, 142
Dr. Allport 136, 138
Dr. Cook 137, 138
Dr. Atkinson 138, 140, 142
Dr. Abbott 139
Dr. Rhein 140
Dr. Robinson 140

SECTION III.

Dental Literature—discussed by

Prof. Mayr 148, 149
Dr. Taft 149
Dr. Friedrichs 149

SECTION IV.

Herbst's Method—discussed by

Dr. Atkinson 151
Dr. Abbott 151, 152
Dr. R. Finley Hunt 152
Dr. Daboll 152
Dr. Friedrichs 152
Dr. Stockton 153
Dr. Watkins 153, 157
Dr. Barrett 153
Dr. A. O. Hunt 154, 155
Dr. Crouse 155
Dr. Allport 156
Dr. Barker 156
Dr. F. Y. Clark 156
Dr. Rhein 157

SECTION V.

Histology and Development of the Teeth—discussed by

Dr. Atkinson 176
Dr. Rhein 177
The President 177
Dr. Cushing 177
Dr. Abbott 177, 180
Dr. Peirce 179
Dr. Spalding 179, 180

AMENDED CONSTITUTION.

ADOPTED AT SARATOGA, AUGUST, 1869, WITH AMENDMENTS UP TO AND INCLUDING THE SESSION OF 1884.

ARTICLE I.

NAME.

NAME.—This organization shall be known by the name of the AMERICAN DENTAL ASSOCIATION.

ARTICLE II.

OBJECTS.

OBJECTS.—The objects of this Association shall be to cultivate the science and art of Dentistry, and all its collateral branches; to elevate and sustain the professional character of Dentists, to promote among them mutual improvement, social intercourse, and good feeling, and collectively to represent and have cognizance of the common interests of the Dental Profession.

ARTICLE III.

DELEGATES FROM LOCAL SOCIETIES.

SECTION 1.—MEMBERSHIP; NUMBER OF DELEGATES FROM LOCAL SOCIETIES.—Each local society may send one for every five of its active members, and each Dental College one from its faculty as delegates to this Association for one year, upon complying with the requirements of its Constitution; but no society shall be entitled to representation that does not adopt or substantially recognize its Code of Ethics.

MEMBERS EXPELLED FROM LOCAL SOCIETIES.

SEC. 2.—EXPELLED MEMBERS.—Any member of this Association being expelled or suspended from his local society, shall from that date cease to be a member of this body. [Amended 1880.]

CLASSES OF MEMBERS and their Privileges.

SEC. 3.—MEMBERS TO BE OF THREE CLASSES.—The members of this Association shall be of three classes, viz.: Delegates, permanent, and honorary members; the two former classes having equal rights and privileges, except eligibility to office and membership of the Sections—none being eligible to hold office except permanent members; the latter class to consist of prominent, worthy members of the dental profession residing in foreign countries, who shall be elected by ballot.

HONORARY MEMBERS.

DELEGATES. Qualifications and Appointment of.

SEC. 4.—DELEGATES.—All delegates shall be practitioners of Dentistry; they shall receive their appointment only from permanently organized Dental Societies and Dental Colleges, having definite conditions of membership other than pecuniary, which shall have been approved by the Executive Committee, and a copy of which shall be in the hands of the Recording Secretary of this body.

After August, 1875, must be graduates.

This Association will hereafter receive no delegates, who shall after this date [August, 1875,] enter the profession without first having graduated at some reputable dental or medical college.

PERMANENT MEMBERS.

SEC. 5.—PERMANENT MEMBERS.—Permanent members shall consist of those who, having served one year as delegates, and complied with the requirements of the Association, shall signify to the Treasurer a desire for permanent membership. After the resignation of a member has been accepted, the Association may at any time thereafter reinstate such member by unanimous consent. [Amended 1881.]

Reinstatement of.

CONSTITUTION TO BE SIGNED before speaking or voting.

SEC. 6.—SIGNING CONSTITUTION.—Each new member, before voting or speaking on any subject before the meeting, shall sign these regulations, inscribing his name and the title and location of the institution from which he receives his appointment.

DUES. Members cannot speak or vote, if unpaid.

SEC. 7.—DUES.—Five dollars shall be paid to the Treasurer by each member yearly, as dues, before he can be eligible to office, or speak or vote on any sub-

ject before the Association; and in case the dues remain unpaid at the close of the second annual meeting thereafter, the name of any such delinquent shall be erased from the list of members without further action.

DUES. Penalty for failure to pay.

SEC. 8.—GIVING NAME ON RISING.—No one shall be permitted to address the Association before giving his name and residence, which shall be distinctly announced from the Chair; nor shall he speak more than twice, nor longer than fifteen minutes in all, unless by consent of the Association.

ADDRESSING ASSOCIATION,— giving name on rising.

SEC. 9.—CONDUCT OF MEMBERS.—Any act of special immorality or unprofessional conduct committed by a member of this Association shall be referred to the Executive Committee (Second Division), whose duty it shall be to thoroughly examine into the case, and report at the next meeting if the charges be sustained. Whereupon, by a vote, the offending member may be reprimanded or expelled, a two-thirds vote being required for expulsion, a majority being sufficient for reprimand.

IMMORAL OR UNPROFESSIONAL CONDUCT, how punished.

ARTICLE IV.

TIME OF MEETINGS.—The regular meetings of the Association shall be held annually, and commence on the first Tuesday in August. The place of meeting shall be determined each year by vote of the Association. After the selection of a place of meeting there shall be appointed by the President, annually, a committee of three, residing at or near the place selected for the next meeting, whose duty it shall be to procure rooms for meetings, clinics, and for the exhibition of mechanical appliances, and to make such other local arrangements as may be needed for the Association. This committee shall act under the direction of the First Division of the Executive Committee.

TIME OF MEETINGS.

PLACE OF MEETINGS.

LOCAL COMMITTEE OF ARRANGEMENTS.

SEC. 2.—The officers may, for extraordinary reasons change the time and place of meeting, upon the

TIME AND PLACE OF MEETING, how changed.

written consent of ten (10) of the fifteen (15) officers. [Amended 1882.]

ARTICLE V.

SECTION 1.—OFFICERS, HOW ELECTED.—The officers of this Association shall be a President, two Vice-Presidents, Corresponding Secretary, Recording Secretary, Treasurer, and the Executive Committee, who shall be elected by ballot without nomination. The three names, or in case of a tie, the four names having the greatest number of votes shall be the sole nominees in case of failure to elect on the first ballot, and a majority of all the votes cast for those names shall be necessary to a choice.

OFFICERS, How elected.

Each officer, except as otherwise provided, shall hold his appointment for one year, or until another is elected to succeed him.

Term of office.

SEC. 2.—PRESIDENT: DUTIES OF.—The President shall preside according to parliamentary usage, as laid down in "Cushing's Manual" and the Rules of Order adopted by this Association.

PRESIDENT, Duties of.

SEC. 3.—VICE-PRESIDENTS.—In the absence of the President, one of the Vice-Presidents shall perform the duties of the office, and in the absence of these officers a Chairman *pro tem.* shall be appointed by acclamation.

VICE-PRESIDENTS, Duties of.

SEC. 4.—CORRESPONDING SECRETARY.—The Corresponding Secretary shall attend to the correspondence of the Association with the societies therein represented, and to correspondence with other scientific bodies as may be desirable.

CORRESPONDING SECRETARY, Duties of.

SEC. 5.—RECORDING SECRETARY.—The Recording Secretary shall keep accurate minutes of the proceedings of the Association, preserve the archives and unpublished documents, and attend to the other duties that pertain to his office. He shall be *ex-officio* chairman of the Publication Committee, and shall see that due notice is given of the time and place of meeting of the Association.

RECORDING SECRETARY, Duties of.

Ex-officio Chairman of Publication Committee.

SEC. 6.—EXECUTIVE COMMITTEE.—The Executive Committee shall be the business committee of the Association, and shall consist of nine members, to whom shall be referred all business not otherwise specially provided for. They shall report at each meeting under the proper head their doings for the current year.

EXECUTIVE COMMITTEE, Duties of, in general.

SUB-COMMITTEES.—FIRST DIVISION: COMMITTEE OF ARRANGEMENTS.—Three members of this committee shall act as the Committee of Arrangements, and shall procure suitable accommodations for the meetings and clinics, and for the exhibition and examination of appliances, of which they shall have the charge. These three shall attend generally to the wants of the Association during its session.

FIRST DIVISION: Committee of Arrangements.

SECOND DIVISION: CREDENTIALS AND AUDITING COMMITTEE.—Other three shall examine and verify the credentials and qualifications of members, including all violations of the Code of Ethics and the Constitution, and shall also be the Auditing Committee for that year.

SECOND DIVISION: Credentials and Auditing Committee.

THIRD DIVISION: COMMITTEE ON VOLUNTEER ESSAYS.—The remaining three shall examine all volunteer essays, and before they are read to the Association shall give their approval, in order that time may not be taken up by unworthy or irrelevant matter.

THIRD DIVISION: Committee on Voluntary Essays.

They shall report the names of places for the next meeting.

To report places for meeting.

PUBLICATION COMMITTEE: HOW APPOINTED.—The President shall appoint two members of this Association, who shall act in conjunction with the Recording Secretary as the Publication Committee. They shall be authorized to employ a competent reporter to furnish an accurate report of the proceedings of each meeting.

PUBLICATION COMMITTEE, how appointed.

INSTRUCTIONS TO THE PUBLICATION COMMITTEE.—They shall superintend the publication and distribution of such portions of the Transactions as the

PUBLICATION COMMITTEE, Instructions to.

Association may direct, or the committee judge to be of sufficient value. They shall specify in the annual report of this committee the character and cost of the publications of the Association during the year, and the number of copies still on hand. Any report or other paper to be entitled to publication in the volume of the Transactions for the year in which it shall be presented to the Association must be placed in the hands of the Publication Committee on or before the first day of September, and must also be so prepared that the proof-sheets furnished the authors shall be returned to the committee without material alteration or addition.

REPORTS AND PAPERS must be in their hands when.

Every paper received by this Association, and all plates or other means of illustration, shall be considered the exclusive property of the Association, and shall be published for its benefit. [Amended 1880.]

Papers the property of the Association.

DISCLAIMER.—This committee is hereby instructed to print at the beginning of each volume of the Transactions the following disclaimer, viz.: "The American Dental Association, although formally accepting and publishing the reports of the various Standing Committees, and the essays read before the Association, holds itself wholly irresponsible for the opinions, theories, or criticisms therein contained, except when otherwise decided by special resolution."

DISCLAIMER.

REPORTS OF SUB-COMMITTEES.—Each of these sub-committees shall report from time to time, as may be necessary, to the Executive Committee as a whole, who shall decide upon such report, if possible; but in case of their inability to decide upon any matter, it shall be brought before the Association for its decision as early as practicable.

REPORTS OF SUB-COMMITTEES.

CLASSIFICATION OF EXECUTIVE COMMITTEE.—At the first election of this committee, the first three shall be elected to serve three years, the second three for two years, and the last three for one year, and thenceforward three new members shall be elected each year

EXECUTIVE COMMITTEE, Classification of.

by ballot, to serve three years, and in case of the absence of any member of this committee his place may be temporarily filled by the remaining members of the committee.

MEETINGS OF EXECUTIVE COMMITTEE.—The Executive Committee shall, if possible, meet for consultation and arrangement of their respective duties on the day preceding the annual meeting of the Association, and shall meet for the examination of credentials, the arrangement of appliances, and the reception of papers, and such other business as may properly come before them at 8 A.M. on the day of the annual meeting.

EXECUTIVE COMMITTEE, Meetings of.

SUBDIVISION OF EXECUTIVE COMMITTEE.—They shall also meet after the election of new members to the committee to choose their own chairman and secretary, and to divide themselves into sub-committees as hereinbefore provided, and for the purposes described.

EXECUTIVE COMMITTEE, Subdivision of.

CHAIRMAN MAY CONVENE THE COMMITTEE.—The chairman of this committee may at his own discretion summon the members thereof to a meeting at any suitable hour during the sessions of the Association.

EXECUTIVE COMMITTEE, Chairman of, may convene.

SEC. 7.—TREASURER TO ATTEND TO RECEIVE DUES AT 8 A.M.—The Treasurer shall hold all the moneys belonging to theAssociation, and shall keep an accurate account as between the Society and its members. He shall attend the meeting of the Executive Committee at 8 A.M. on the day of the annual meeting to receive dues, and shall attend at roll-call to verify the list of names, checking all such as are in arrears for dues; he shall restore such names upon payment of dues within the legal limits, and shall notify all whose names may be erased from the list of membership. He shall pay the drafts of the President, countersigned by the Secretary, upon vote of the Society only, and shall report to the Executive Committee, where his

TREASURER, Duties of.

accounts shall be audited and by whom his report shall be presented to the Association, together with their own.

APPROPRIATION OF MONEY.

All resolutions appropriating money, except for the legitimate expenses of this Association, shall require a two-thirds vote of all the members present. [Amended 1883.]

ARTICLE VI.

[Amended (Sections 1, 2, and 3) 1884.]

PERMANENT SECTIONS, Division of.

SECTION 1.—To prepare, arrange, and expedite business, this Association shall be divided into seven Sections, as follows:

1. Prosthetic Dentistry, Metallurgy, and Chemistry.
2. Dental Education.
3. Dental Literature and Nomenclature.
4. Operative Dentistry.
5. Anatomy, Histology, and Microscopy.
6. Pathology, Therapeutics, and Materia Medica.
7. Physiology and Etiology. [Amended 1881.]

PERMANENT SECTIONS, Organization of.

SEC. 2.—It shall be the duty of each permanent member to inform the Recording Secretary, before the close of the morning session of the second day of the annual meeting, which of the seven Sections he elects to join for the ensuing year. He shall be free to follow his own preferences as to the particular channel in which he will labor, but can be a member of but one Section during the same year.

[But he may present volunteer papers to any of the other Sections.—SEC'Y.]

PERMANENT SECTIONS, Time and manner of organization of.

SEC. 3.—It shall be the duty of the Recording Secretary, immediately before the close of the above morning session of the second day, to make out lists of the names thus furnished of each Section, as a basis for the election of officers of said Sections, whereupon the Sections shall immediately proceed to the

election of chairmen and such other officers as they may see fit.

SEC. 4.—The chairman shall preside at all meetings of his Section; shall exercise general supervision over the business, and shall see that the labors of his Section are conducted in the manner calculated to secure the best results. The chairman, or such other member or members as the Section shall select, shall prepare and read at the annual meeting of the Association next ensuing a paper or papers on the advances and discoveries of the past year in the branches included in the Section. The reading of such papers shall not together occupy more than forty minutes.

PERMANENT SECTIONS, Duties of Chairmen of.

SEC. 5.—The several Sections shall meet at 10 A.M. on the morning of the first day of the annual meeting of the Association.

PERMANENT SECTIONS, Time of meeting of.

SEC. 6.—For the information of all members, a list of the members of each Section shall be published in the Transactions of each year. [Amended 1878.]

PERMANENT SECTIONS, List of members of, to be published.

ARTICLE VII.

QUORUM.—Fifteen members shall constitute a quorum for the transaction of business in this Association.

QUORUM FOR BUSINESS.

ARTICLE VIII.

SUSPENDING RULES: THREE-FOURTHS TO VOTE.—This order of business may be temporarily suspended by a three-fourths vote of all the members present, for the consideration of a specific subject, upon the completion of which the regular order shall be at once resumed.

SUSPENSION OF RULES, how made.

RULES OF ORDER.

1. On the arrival of the hour of meeting, the President shall take the chair, call to order, and announce that the meeting is open for business.

2. No motion or speech shall be in order until the mover or speaker shall have been recognized and assigned the floor by the Chair, nor shall a motion be open for debate until seconded and stated by the Chair.

3. At the request of any member a motion shall be put in writing.

4. At the request of five members a question shall be divided, or the yeas and nays ordered.

5. When a question is under debate, no other motion shall be in order, except—1st, to adjourn; 2d, to lay on the table; 3d, the previous question; 4th, to postpone; 5th, to commit; 6th, to amend; and these motions shall take precedence in the order here stated.

6. The previous question, and the motions to adjourn, to lay on the table, and to postpone, shall be decided without debate.

7. A motion to adjourn shall always be in order, but no member can make such a motion while another is speaking, or while a vote or ballot is being taken.

8. A second amendment to the main question shall not be in order until the first is disposed of, nor shall there be an amendment of an amendment to an amendment.

9. After a motion has been seconded and stated by the Chair, it shall not be withdrawn without the consent of the Society.

10. No member shall interrupt another while speaking, except to call him to order.

11. When called to order, a member shall sit down until the point of order is decided by the Chair, or, in case of appeal, by the Society.

If the point of order be sustained, the member can proceed in order by the consent of the Society.

12. Every member shall vote upon a question unless excused by the Society.

13. When any motion, except to adjourn, has been rejected, it shall not be renewed without unanimous consent.

14. Any member who voted in the majority may move a reconsideration of that question, but if that motion shall be lost or laid upon the table, it shall not be renewed without unanimous consent.

15. The President may vote with the members upon all questions, but having so voted, shall not give the casting vote in case of a tie.

16. Motions for filling blanks shall be put in the order in which they are moved.

17. On a division, or in voting by yeas and nays, any member may change his vote before the result is declared.

18. These rules may be suspended by unanimous consent.

ORDER OF BUSINESS.

1. Meeting of the Executive Committee, filling of vacancies therein, examination of credentials, and payment of dues, 8 A.M.

2. Meetings of the Sections at 10 A.M.

3. Organization of the Association at 11 A.M.

4. Calling the roll of qualified members.

5. Reading of the minutes and action thereon.

6. The reading and consideration of the stated annual reports from the Sections, together with volunteer papers upon the same subjects in their consecutive order.

7. Report of Executive Committee.

8. Balloting for the place of next annual meeting.

9. Election of officers and three members of Executive Committee.

10. Instructions to the permanent committees.

11. Unfinished, new, and miscellaneous business.

12. Adjournment.

AMENDMENTS.

Alterations and amendments may be made in the foregoing Articles or Rules of Order at any annual meeting, by the consent of all the members present. Otherwise notification in writing shall be made of any such proposed alterations or amendments, and laid over for one year for final action, when they can only be adopted by an affirmative vote of two-thirds of the members present.

STANDING RESOLUTIONS.

The following standing resolutions are in force at this time, August 1, 1885.

Resolved, That henceforth no person shall be received as a delegate who is in arrears for dues, or until he has paid to the Treasurer the full amount due at the time his name was dropped for non-payment.

Adopted August, 1874.

Resolved, That hereafter no dental college shall be entitled to representation in this Association that does not require a good English education as a preliminary qualification for its matriculants, to be ascertained by examination.

Adopted August, 1879.

Resolved, That in order to secure representation in this Association, dental colleges must, subsequent to October, 1881, require all students entering therein to take two full courses of lectures previous to coming forward for examination

and graduation, and must also state these conditions in their next annual announcement.

Adopted August, 1880.

Resolved, That hereafter no society shall be entitled to representation in this Association that does not require its members to live up to the requirements of our Code of Ethics.

Resolved, When it comes to the knowledge of the Committee on Credentials that any applicant for membership is violating our Code, said applicant shall not be received, and all such applicants shall be referred by the committee to the societies whose delegates they are, and in no case shall this Association be compelled to treat with violations of the Code, except where the violator is a member of this body and has no membership in any local society.

Adopted 1881.

Resolved, That the Secretary be instructed to assign members who may neglect to make their own choice the Section in which they are expected to work.

Adopted 1879.

Resolved, That the reports of Sections shall be called by the President in consecutive order, beginning each succeeding year one number higher than on the preceding year.

1879	commencing	with	No. I.
1880	"	"	No. II.
1881	"	"	No. III.
1882	"	"	No. IV.
1883	"	"	No. V.
1884	"	"	No. VI.
1885	"	"	No. VII.
1886	"	"	No. I.

Adopted 1879.

CODE OF DENTAL ETHICS.*

ARTICLE I.

THE DUTIES OF THE PROFESSION TO THEIR PATIENTS.

SECTION 1.—The dentist should be ever ready to respond to the wants of his patrons, and should fully recognize the obligations involved in the discharge of his duties toward them. As they are, in most cases, unable to correctly estimate the character of his operations, his own sense of right must guarantee faithfulness in their performance. His manner should be firm, yet kind and sympathizing, so as to gain the respect and confidence of his patients; and even the simplest case committed to his care should receive that attention which is due to any operation performed on living, sensitive tissue.

SEC. 2.—It is not to be expected that the patient will possess a very extended or a very accurate knowledge of professional matters. The dentist should make due allowance for this, patiently explaining many things which may seem quite clear to himself, thus endeavoring to educate the public mind so that it will properly appreciate the beneficent efforts of our profession. He should encourage no false hopes by promising success where, in the nature of the case, there is uncertainty.

SEC. 3.—The dentist should be temperate in all things, keeping both mind and body in the best possible health, that his patients may have the benefit of that clearness of judgment and skill which is their right.

ARTICLE II.

MAINTAINING PROFESSIONAL CHARACTER.

SECTION 1.—A member of the dental profession is bound to maintain its honor, and to labor earnestly to extend its sphere of usefulness. He should avoid everything in language and conduct calculated to discredit or dishonor his profession, and should ever manifest a due respect for his brethren. The young should show special respect to their seniors; the aged special encouragement to their juniors.

*Adopted August, 1866.

SEC. 2.—The person and office arrangements of the dentist should indicate that he is a gentleman; and he should sustain a high-toned moral character.

SEC. 3.—It is unprofessional to resort to public advertisements, such as cards, hand-bills, posters, or signs calling attention to peculiar styles of work, prices for services, special modes of operating, or to claim superiority over neighboring practitioners; to publish reports of cases, or certificates in the public prints; to go from house to house soliciting or performing operations; to circulate or recommend nostrums, or to perform any other similar acts. But nothing in this section shall be so construed as to imply that it is unprofessional for dentists to announce in the public prints, or by card, simply their names, occupation, and place of business; or in the same manner, to announce their removal, absence from, or return to business; or to issue, to their patients, appointment cards having a fee bill for professional services thereon.

SEC. 4.—When consulted by the patient of another practitioner the dentist should guard against inquiries or hints disparaging to the family dentist, or calculated to weaken the patient's confidence in him; and, if the interests of the patient will not be endangered thereby, the case should be temporarily treated, and referred back to the family dentist.

SEC. 5.—When general rules shall have been adopted by members of the profession practicing in the same localities, in relation to fees, it is unprofessional and dishonorable to depart from these rules, except when variation of circumstances requires it. And it is ever to be regarded as unprofessional to warrant operations or work as an inducement to patronage.

ARTICLE III.

THE RELATIVE DUTIES OF DENTISTS AND PHYSICIANS.

Dental surgery is a specialty in medical science. Physicians and dentists should both bear this in mind. The dentist is professionally limited to diseases of the dental organs and the mouth. With these he should be more familiar than the general practitioner is expected to be; and, while he recognizes the superiority of the physician in regard to diseases of the general system, the latter is under equal obligations to respect his higher attainments in his specialty. Where this principle governs, there can be no conflict, or even diversity, of professional interests.

ARTICLE IV.

THE MUTUAL DUTIES OF THE PROFESSION AND THE PUBLIC.

Dentists are frequent witnesses, and at the same time the best judges, of the impositions perpetrated by quacks, and it is their duty to enlighten and warn the public in regard to them. For this and the many other benefits conferred by the competent and honorable dentist, the profession is entitled to the confidence and respect of the public, who should always discriminate in favor of the true man of science and integrity, and against the empiric and impostor. The public has no right to tax the time and talents of the profession in examinations, prescriptions, or in any way, without proper remuneration.

MINUTES OF TRANSACTIONS

OF THE

AMERICAN DENTAL ASSOCIATION.

SESSION OF 1884.

BY GEO. H. CUSHING, SECRETARY.

FIRST DAY—MORNING SESSION.

THE AMERICAN DENTAL ASSOCIATION commenced its Twenty-fourth Annual Session in the Court Chambers, Saratoga Springs, N. Y., on Tuesday, August 5, 1884, at 11 o'clock A. M., the President, E. T. Darby, in the chair.

Prayer was offered by the Rev. Dr. Joseph Cary.

The roll of members was then called, and the following were found either to be present or to have forwarded their dues:

ATKINSON, W. H.	41 East Ninth st., New York.
ABBOTT, FRANK	22 West Fortieth st., New York.
*ALLEN, E. H.	Freeport, Ill.
ALLEN, JOHN	7 West Thirty-third st., New York.
ALLPORT, W. W.	240 Wabash ave., Chicago, Ill.
*AMES, W. B.	84 Monroe st., Chicago, Ill.
AMBLER, J. G.	16 East Forty-second st., New York.
*BROWN, S. B.	Fort Wayne, Ind.
BARRETT, W. C.	11 West Chippewa st., Buffalo, N. Y.
*BUTLER, C. R.	519 Euclid ave., Cleveland, Ohio.
*BAIRD, W. H.	Burlington, Iowa.
*BAUER, JOSEPH	180 Esplanade st., New Orleans, La.
BISHOP, J. ADAMS	82 West Thirty-sixth st., New York.
BOGUE, E. A.	29 East Twentieth st., New York.
BROWN, E. PARMLY	Flushing, Long Island, N. Y.

* Those marked thus were absent, but sent their dues.

d Those marked thus were delegates, and not permanent members.

*Boice, Alonzo	1612 Vine st., Philadelphia, Pa.
*Brackett, C. A.	102 Touro st., Newport, R. I.
*Brockway, A. H.	13 Greene ave., Brooklyn, N. Y.
*Brophy, Truman W.	125 State st., Chicago, Ill.
*Brown, Ira	225 Detroit st., Cleveland Ohio.
*Beck, C. S.	58 North Main st., Wilkesbarre, Pa.
Booth, Charles F.	Canandaigua, N. Y.
Barlow, F. C.	646 Jersey ave., Jersey City, N. J.
d. Barker, William	Providence, R. I.
d. Brewster, Richard C.	134 Lafayette ave., Brooklyn, N. Y.
*Bullock, C.	Cambridgeport, Mass.
*Cowie, Henry	Detroit, Mich.
Colgrove, W. H.	Johnstown, N. Y.
Cushing, George H.	84 Monroe st., Chicago, Ill.
Crouse, J. N.	2101 Michigan ave., Chicago, Ill.
*Chaim, M. L.	18 Cooper Union, New York.
Cook, C. D.	133 Pacific st., Brooklyn, N. Y.
Clifton, W. R.	Waco, Texas.
Clark, F. Y.	85 West Thirty-fifth st., N. Y.
*Cleland, James	81 State st., Detroit, Mich.
*Clement, C. W.	939 Elm st., Manchester, N. H.
*Colton, Aaron	Hudson, N. Y.
Darby, E. T.	1513 Walnut st., Philadelphia, Pa.
*Dunn, Charles E.	Louisville, Ky.
Dudley, A. M.	304 Essex st., Salem, Mass.
*Devore, J. H.	Corry, Pa.
Daboll, G. C.	Buffalo, N. Y.
*Dutch, William	22 Montgomery st., San Francisco, Cal.
*Emminger, A. F.	182 Broad st. Columbus, Ohio.
*Freeman, S. A.	14 Court st., Buffalo, N. Y.
Farrar, J. N.	Apartment No. 1 Rensselaer, cor. Broadway and Thirty-second st., New York.
*Fundenberg, W. H.	823 Penn ave., Pittsburg, Pa.
Finley, M. F.	Washington, D. C.
Field, George L.	Detroit, Mich.
Friedrichs, G. J.	155 St. Charles st., New Orleans, La.
Foster, M. W.	48 Franklin st., Baltimore, Md.
*Francis, Charles E.	83 West Forty-seventh st., New York.
*Freeman, A. W.	N. W. cor. State and Madison sts., Chicago, Ill.
*Fillebrown, Thomas	Portland, Maine.
Gaylord, E. S.	New Haven, Conn.
Guilford, S. H.	1513 Walnut st., Philadelphia, Pa.
Gardiner, Frank H.	126 State st., Chicago, Ill.
*Gilmer, T. L.	Quincy, Ill.
Gibbons, David	Warren, Ohio.
*Harroun, C. H.	115 Summit st., Toledo, Ohio.

* Hill, J. L.	Gettysburg, Pa.
Hooper, J.	828 Fourth ave., Louisville, Ky.
* Hoysradt, G. W.	Ithaca, N. Y.
Harlan, A. W.	70 Dearborn st., Chicago, Ill.
* Honsinger, E.	818 Park ave., Chicago, Ill.
* Holmes, E. S.	Grand Rapids, Mich.
Hunter, Frank A.	123 West Seventh st., Cincinnati, O.
How, W. Storer	Chestnut st., cor. Twelfth, Phila., Pa.
Hunt, A. O.	Iowa City, Iowa.
Hodge, S. D.	Burlington, Vt.
Hawes, Earl P.	Providence, R. I.
Horne, R. F.	Watertown, Mass.
Hunt, R. Finley	1113 F st., N.W., Washington City, D. C.
Holbrook, Charles W. F.	Newark, N. J.
* Hacker, T. S.	28½ East Ohio st., Indianapolis, Ind.
* Horton, W. P.	177 Euclid ave., Cleveland, Ohio.
* Ingersoll, L. C.	Keokuk, Iowa.
* Jackson, H. H.	317 Jefferson ave., Detroit, Mich.
Jackson, V. H.	51 East One hunded and Twenty-fifth st., New York.
Jefferis, C. R.	908 King st., Wilmington, Del.
Keely, George W.	cor. High and Main sts., Oxford, Ohio.
* Keely, Chas. I.	cor. High and Third sts., Hamilton, O.
* Kingsbury, C. A.	1119 Walnut st., Philadelphia, Pa.
* Keith, H. H.	1515 Washington ave., St. Louis, Mo.
Kingsley, Norman W.	25 West Twenty-seventh st., New York.
Keech, Edward P.	127 North Charles st., Baltimore, Md.
* Knowles, Samuel E.	S. E. cor. Post and Dupont sts., San Francisco, Cal.
* Leiter, Thos. C.	Wadsworth, Ohio.
* Lathrop, Joseph	152 Woodward ave., Detroit, Mich.
d. Lewis, James	Burlington, Vt.
Levy, Fred A.	Orange, N. J.
* Morrison, W. N.	1337 Washington ave., St. Louis, Mo.
McManus, James	Hartford, Conn.
McKellops, H. J.	2630 Washington ave., St. Louis, Mo.
Moore, E. C.	27 Lafayette ave., Detroit, Mich.
* Moore, T. T.	Columbia, S. C.
McElhaney, G. W.	Columbus, Ga.
Merritt, Charles	39 West Forty-second st., New York.
Meloney, C. W.	54 West Forty-eighth st., New York.
Meeker, Chas. A.	27 Fulton st., Newark, N. J.
* Marcklein, B. G.	Iron block, Milwaukee, Wis.
* Noble, H. B.	1111 Penna. ave., Washington, D. C.
* Northrop, A. L.	44 West Forty-sixth st., New York.
Odell, F. M.	7 West Thirty-eighth st., New York.
Osgood, Charles H.	147 Tremont st., Boston, Mass.

PEIRCE, C. N.	1415 Walnut st., Philadelphia, Pa.
* PERRY, S. G.	46 West Thirty-seventh st., New York.
* PRIEST, A. N.	Utica, N. Y.
PETERSON, DENTON E.	Waterloo, N. Y.
PALMER, J. W.	Fitchburg, Mass.
* PALMER, S. B.	39½ Warren st., Syracuse, N. Y.
d. PINNEY, WORTHINGTON	72 Park place, Newark, N. J.
* PAGE, W. E.	Room 11, Studio building, Boston, Mass.
* PATTERSON, J. D.	S. W. cor. Eighth and Main sts., Kansas City, Mo.
* PRUYN CHARLES P.	70 Dearborn st., Chicago, Ill.
ROBINSON, J. A.	Jackson, Mich.
* RHONE, J. W.	Bellefonte, Pa.
RHEIN, M. L.	7 West Thirty-eighth st., New York.
RICH, C. F.	Saratoga, N. Y.
* RICHTER, R. G.	128 Wisconsin st., Milwaukee, Wis.
SMITH, H. A.	286 Race st., Cincinnati, O.
* STARBUCK, W. C.	Jamaica Plain, Mass.
* SMITH, J. H.	New Haven, Conn.
SHEPARD, L. D.	100 Boylston st., Boston, Mass.
* SMITH, EUGENE H.	283 Dartmouth st., Boston, Mass.
STOCKTON, C. S.	Newark, N. J.
* SWAIN, E. D.	65 Randolph st., Chicago, Ill.
* STEVENS, S. G.	Lynn, Mass.
d. SPALDING, C. W.	1525 Olive st., St. Louis, Mo.
SWASEY, J. A.	3008 Michigan ave., Chicago, Ill.
d. SEARLE, FLAVIUS	Springfield, Mass.
SMITH, A. T.	Minneapolis, Minn.
TAFT, J.	122 West Seventh st., Cincinnati, O.
* TOLEDO, M. V.	118 East Eighteenth st., New York.
TRUEMAN, W. H.	900 Spruce st., Philadelphia, Pa.
* TILLINGHAST, W. H.	Providence, R. I.
TIMME, C. A.	190 Hudson st., Hoboken, N. J.
* VIET, M.	12 Dauphin st., New Orleans, La.
* WATLING, J. A.	Ypsilanti, Mich.
* WENDELL, W. C.	Iron block, Milwaukee, Wis.
* WATERS, G. F.	8 Beacon st., Boston, Mass.
* WILLIAMS, I.	New Philadelphia, Ohio.
* WILSON, I. P.	Burlington, Iowa.
* WERNER, J. G. W.	41 Upton st., Boston, Mass.
WATKINS, S. C. G.	Mont Clair, N. J.
WADSWORTH, T. A.	159 West Thirty-fourth st., New York.
WHITE, SAMUEL A.	Savannah, Ga.
WALKER, WILLIAM WALLACE	67 West Ninth st., New York.
WALTON, J. C.	Howell, Mich.
WILLIAMS, J. L.	632 Chapel st., New Haven, Conn.
WINGERTER, C. A.	Wheeling, W. Va.

WASSALL, J. W.	Room 82, 103 State st., Chicago, Ill.
WADSWORTH, E. C. . . .	53 Bedford ave., Brooklyn, N. Y.

Any inaccuracies in the above list, either of names or locations, should be reported to the Treasurer at once, in order that the necessary correction of the record may be made.

Annual dues being payable in advance, no name appears on above list except those who have paid for 1884, and Transactions are not sent to any who have not fully paid their dues.

On motion, the reading of the minutes of the last session was dispensed with.

The Executive Committee made a report of programme, which was accepted and adopted.

On motion of Dr. Odell, the time from three to seven o'clock on Wednesday afternoon was set apart for clinics.

The Executive Committee made a partial report on credentials, which was subsequently completed, accepted, and adopted, as follows:

Brooklyn Dental Society—C. D. Cook, R. C. Brewster, E. C. Wadsworth, J. N. Farrar.

Connecticut Valley Dental Association—James McManus, J. L. Williams.

Chicago Dental Society—A. W. Harlan, J. A. Swasey, J. N. Crouse, F. H. Gardiner.

Dental Society of the State of New York—J. G. Ambler, C. F. Rich, W. W. Walker.

Dental Association of Maryland and District of Columbia—M. W. Foster, Edward P. Keech.

First District Dental Society of the State of New York—T. A. Wadsworth.

Illinois State Dental Society—George H. Cushing, W. W. Allport, J. W. Wassall.

Iowa State Dental Association—A. O. Hunt.

Kentucky Dental Association—J. Hooper.

Michigan Dental Association—J. C. Walton.

Minnesota State Dental Association—A. T. Smith.

New England Dental Society—S. D. Hodge, R. F. Horne, A. M. Dudley, J. W. Palmer, F. Searle, Wm. Barker.

New Jersey State Dental Society—C. A. Timme, F. A. Levy, Chas. A. Meeker, F. C. Barlow, C. S. Stockton, Worthington Pinney, Chas. W. F. Holbrook.

Odontological Society of Pennsylvania—C. R. Jefferis.

Ohio Valley Dental Society—Charles A. Wingerter.

Ohio State Dental Society—David Gibbons.

Pennsylvania State Dental Society—W. H. Trueman.

St. Louis Dental Society—C. W. Spalding.

Sixth District Dental Society of the State of New York—W. C. Stewart.

Seventh District Dental Society of the State of New York—Charles F. Booth.

Society of the Alumni of the Dental Department of the University of Pennsylvania—Earl P. Hawes.

Washington City Dental Society—R. Finley Hunt.

On motion of Dr. Cushing, the following amendment to the Constitution was unanimously adopted—to take effect at once: To amend sect. 2 of Art. VI. by changing "*third* day" to "*second* day." Also, sect. 3 of Art. VI. by changing the word "*after*" to "*before*," and "*third* day" to "*second* day," and to add the following after the last word, "Sections," "whereupon the Sections shall immediately proceed to the election of chairmen, and such other officers as they may see fit," and to strike out sects. 4 and 5, and change the numbers of sects. 6, 7, and 8 to 4, 5, and 6.

The President then read the annual address.

On motion of Dr. Ambler so much of the President's address as referred to the death of Dr. Buckingham was referred to a committee of three, who were afterwards appointed, as follows: J. G. Ambler, chairman; J. Taft and John Allen.

Dr. McKellops moved that the following committee be appointed to suggest some means of increasing the attendance upon this Association: E. Parmly Brown, chairman; G. W. McElhaney, A. W. Harlan, J. Taft, and M. W. Foster. Adopted.

The Publication Committee made the following report, which was accepted and referred to the Executive Committee, who subsequently reported it back with their approval:

SARATOGA SPRINGS, August 5, 1884.

The Publication Committee would report that, under the standing instructions of the Association, they made the same arrangement with The S. S. White Dental Manufacturing Co. as in former years, whereby the Transactions were furnished to the Association free of cost; the work has been done as admirably as heretofore, and the committee desire to renew their thanks to Mr. Hise for his care in the supervision of his part of the work, and for the great assistance he has afforded the committee.

The Transactions were mailed March 5, 1884, to all entitled to them, including the libraries, universities, journals, and honorary members, and since that date to those members who the Treasurer notified the committee had subsequently paid their dues. There are now in the hands of the committee about thirty copies.

The receipts and expenditures of the committee are as follows:

Received from Treasurer	$25 00	
" " sale of Transactions	2 00	
		$27 00
Expended for expressage, paper, and copying	$8 80	
" " printing notices	2 50	
" " postage and incidental expenses	18 75	
		80 05
Balance due the committee		$8 05

All of which is respectfully submitted.

GEO. H. CUSHING, *Chairman.*

SARATOGA, August 5, 1884. Audited and approved.

J. N. CROUSE, A. M. DUDLEY, } *Auditing Committee.*

On motion of Dr. Stockton so much of the President's address as had not already been referred to other committees was referred to the committee named by Dr. McKellops.

Dr. Taft moved that we adjourn at 1 P. M., and that the Sections meet immediately thereafter. Carried.

Adjourned at 1 P. M. to meet at 8 P. M.

FIRST DAY—EVENING SESSION.

The Association met at 8.10 P. M., President Darby in the chair.

The minutes of the morning session were read and approved.

Under the head of miscellaneous business Dr. Odell moved that Wednesday evening be set apart to receive the paper and stereopticon exhibition by Dr. J. L. Williams, of Section V. Carried.

The regular order was then taken up, and Section VI. being called, Dr. Harlan, the chairman, read a paper, being a continuation of the subject presented by him last year. He also read a brief statement of the properties of eugenol and sanitas. The subject was discussed by Drs. Odell, Bogue, Harlan, Barrett, Atkinson, Shepard, Peirce, Rhein, Field, Allport and Truman, and on motion of Dr. Odell the further discussion was postponed till to-morrow morning.

The Association then adjourned.

SECOND DAY—MORNING SESSION.

The Association met at 10 A. M., the President, Dr. Darby, in the chair.

The minutes of last evening's session were read and approved.

Under the head of miscellaneous business, on motion, the Secretary was authorized to draw the necessary orders on the Treasurer to pay all properly authenticated bills.

The Executive Committee announced the temporary filling of vacancies in that committee by the appointment of Dr. Shepard, of Boston, and Dr. A. O. Hunt, of Iowa City.

On motion of Dr. Dudley the courtesies of the floor were extended to Prof. Mayr, of Springfield, Mass.

On motion of Dr. Lewis, Drs. J. A. Bazin, G. W. Lovejoy, J. H. Bourden, and S. J. Andres, of Montreal, were invited to participate in the discussions.

A telegram was received from Dr. T. T. Moore, of Columbia, S. C., Second Vice-President of the Association, expressing his regret at being unavoidably absent on account of the serious illness of his wife and daughter.

The regular order being resumed, the subject of Dr. Harlan's paper was further discussed by Drs. Searle, Stockton, R. Finley Hunt, Peirce, Watkins, How, Harlan, E. Parmly Brown, Shepard, and Atkinson.

On motion of Dr. Dudley, the subject was passed.

Section VII. being called, the chairman, Dr. Barrett, read a paper entitled Physiology and Etiology. It was discussed by Prof. Mayr, Drs. Atkinson, Spalding, Barrett, and Abbott.

At 1.30 the special order of organization of Sections came up, and resulted as follows:

Section I. Prosthetic Dentistry, Chemistry, and Metallurgy.—John Allen, chairman; W. H. Trueman, secretary; J. G. Ambler, C. S. Stockton, J. A. Robinson, Chas. W. F. Holbrook, W. H. Fundenberg, J. Hayhurst, H. H. Keith, Alonzo Boice, W. B. Ames, W. H. Dorrance, C. H. Harroun, Thos. C. Leiter, M. L. Chaim, J. N. Farrar, C. Bullock, Henry Cowie, W. R. Clifton, C. W. Clement, D. W. Clancey, J. R. Callahan, Chas. E. Dunn, Wm. Dutch, A. F. Emminger, A. W. Freeman, S. A. Freeman, Gale French, David Gibbons, H. H. Jackson, D. J. Pollock, A. T. Smith, S. D. Stewart, W. H. Tillinghast, E. S. Talbot, Sam'l A. White, Geo. H. Wilson.

SECTION II. Dental Education.—A. O. Hunt, chairman; I. P. Wilson, J. N. Crouse, C. N. Peirce, C. H. Osgood, C. D. Cook, E. S. Holmes, Thos. Fillebrown, T. W. Brophy, E. P. Keech, Seneca B. Brown, Jos. Bauer, Ira Brown, Jas. Cleland, A. Colton, J. H. Coyle, S. W. Dennis, Geo. L. Field, J. L. Hill, T. S. Hacker, P. G. C. Hunt, E. D. Swain, J. A. Swasey, W. C. Wendell, C. A. Wingerter, W. H. Morgan.

SECTION III. Dental Literature and Nomenclature.—J. Taft, chairman; W. H. Atkinson, Geo. J. Friedrichs, M. V. Toledo, C. F. Rich, E. A. Bogue, E. H. Allen, C. A. Kingsbury, A. L. Northrop, A. N. Priest, F. H. Rehwinkel, J. H. Smith.

SECTION IV. Operative Dentistry.—L. D. Shepard, chairman; V. H. Jackson, secretary; E. T. Darby, S. C. G. Watkins, W. H. Colgrove, S. H. Guilford, E. S. Gaylord, M. F. Finley, J. C. Walton, S D. Hodge, E. P. Hawes, C. A. Timme, G. W. Keely, C. I. Keely, Jas. McManus, C. W. Meloney, R. C. Brewster, Wm. W. Walker, F. C. Barlow, F. A. Levy, Chas. A. Meeker, W. Pinney, Robt. F. Horne, E. Parmly Brown, G. W. Hoysradt, J. W. Rhone, J. A. Watling, H. B. Noble, Wm. Barker, C. R. Butler, E. Honsinger, J. H. Devore, W. N. Morrison, W. C. Starbuck, S. B. Palmer, S. G. Stevens, W. E. Page, Eugene H. Smith, G. R. Thomas, S. G. Perry, H. J. McKellops, J. B. Coolidge, I. Williams, Frank A. Hunter, A. H. Brockway, Dwight M. Clapp, J. G. W. Werner, E. C. Moore, J. E. Cravens, G. C. Daboll, M. L. Rhein.

SECTION V. Anatomy, Histology, and Microscopy.—C. F. W. Bödecker, chairman; Frank Abbott, secretary; J. L. Williams, F. Y. Clark, G. H. Cushing, Thomas L. Gilmer, T. T. Moore, G. W. McElhaney, Chas. Merritt, B. G. Marcklein.

SECTION VI. Pathology, Therapeutics, and Materia Medica.—A. W. Harlan, chairman; F. M. Odell, secretary; A. M. Dudley, J. Hooper, J. W. Palmer, W. W. Allport, T. A. Wadsworth, M. W. Foster, W. H. Baird, Wilbur F. Litch, R. G. Richter, C. R. Jefferis, C. A. Brackett, J. D. Patterson, F. H. Gardiner, C. P. Pruyn, L. C. Ingersoll, C. S. Beck, A. J. Friedrichs, H. W. Morgan.

SECTION VII. Physiology and Etiology.—H. A. Smith, chairman; N. W. Kingsley, secretary; Denton E. Peterson, W. C. Barrett, J. W. Wassall, R. Finley Hunt, G. F. Waters, Sam'l E. Knowles, G. W. Klump, Jos. Lathrop.

Adjourned to meet at 8 P. M.

SECOND DAY—EVENING SESSION.

The Association met at 8 P. M., President Darby in the chair.

The reading of the minutes was dispensed with until morning, and the Association heard the paper of Dr. Williams, of Section V. After its conclusion Dr. Barrett announced that a serious accident

had happened to the child of Dr. Clifton, of Waco, Texas, and moved that the heartfelt sympathy of this Association be extended to the father. Carried.

Dr. McKellops moved that the Local Committee of Arrangements be instructed to see that every effort be made to bring to justice the author of the above mentioned accident, and that Dr. F. Y. Clark be requested to act in connection with this committee. Carried.

On motion the committee was instructed to secure for the care of the injured child the services of one or more competent nurses.

The regular order being resumed, the discussion of Dr. Williams's paper, Section V., was opened by Dr. Atkinson, when the Association adjourned to meet at 9.30 A. M. to-morrow.

THIRD DAY—MORNING SESSION.

The Association met at 10 A. M., the President, Dr. Darby, in the chair.

The minutes of the morning and evening sessions of yesterday were read and approved.

Under the head of miscellaneous business, the report of the committee on resolutions touching the death of Dr. T. L. Buckingham was presented. It will be found in the memorial pages.

Remarks were made by Drs. Ambler, Stockton, Taft, John Allen, Friedrichs, Shepard, and Searle, and the resolutions were adopted by a rising vote.

Dr. Atkinson read an extract from a letter from Dr. C. F. W Bödecker.

On motion of Dr. Shepard, Dr. F. Y. Clark was by unanimous vote reinstated as a member of the Association.

The Executive Committee made a further partial report on credentials, which was accepted as a report of progress.

On motion of Dr. McKellops, Dr. Crowell, a visitor, was invited to state the views and plans of the Dental Protective Union.

The regular order being resumed, the discussion of Dr. Barrett's paper was continued by Drs. Peirce and Barrett.

On motion, the regular order was suspended to hear from the president of the village, who gave his assurance that every effort should be made by the authorities to bring to justice the author of the accident to Dr. Clifton's child.

The regular order being again resumed, the further discussion of Dr. Barrett's paper was participated in by Drs. Atkinson, Searle, F. Y. Clark, Daboll, Barrett, and R. Finley Hunt.

The subject was then passed.

Section I. being called, Dr. Trueman read its report. This was followed by a paper by Dr. John Allen, and that by another by Dr. J. A. Robinson.

On motion, the subject was passed.

Section II. was then called, and its report was read by the chairman, Dr. C. N. Peirce. Discussed by Drs. Spalding, R. Finley Hunt, Friedrichs, Allport, Cook, and Abbott, when, on motion, the regular order was suspended for two minutes to hear an announcement, after which the regular order was resumed and further discussed by Drs. Rhein and Atkinson.

On motion the discussion was closed.

The resolutions as suggested by Section II. and amended by the Association were then adopted, as follows:

Resolved, That the American Dental Association deems it incumbent upon all well-regulated dental educational institutions to require from candidates for graduation, that they shall have attended two full courses of lectures in reputable dental institutions before being admitted to examination for the degree of Doctor of Dental Surgery.

Resolved, That the American Dental Association deems it incumbent upon the faculties of all reputable dental schools to require from candidates before admitting them to graduation, not only attendance upon the requisite lectures, but a degree of proficiency in the final examination which shall give evidence of professional worth in both the principles and practice of dentistry.

Resolved, That in reiterating these views so often before expressed, this Association is gratified with the action of the National Association of Dental Faculties at its recent meetings as being so much in accord with them.

[This last resolution was offered by Dr. R. Finley Hunt, as an amendment to those presented by the Section, and was accepted.]

Adjourned to meet at 8 p. m.

THIRD DAY—EVENING SESSION.

The Association met at 8.15 P. M., President Darby in the chair. The minutes of the morning session were read and approved.

Under the head of miscellaneous business Dr. Odell, of the committee to look after the interests of Dr. Clifton's child, made a favorable report of the sufferer's condition.

Dr. Taft, of the committee moved by Dr. McKellops on the President's address, made a report which, on motion of Dr. Kingsley, was recommitted, with instructions to report on printed slips at the meeting next year.

The following amendment to the Constitution was then unanimously adopted:

To change the first part of the title of sect. 1, Art. VI., from "Artificial Dentistry" to "Prosthetic Dentistry."

The regular order being resumed, Section III. was called, and the chairman, Dr. Taft, read a partial report, which was discussed by Prof. Mayr.

On motion the chairman of Section III. was instructed to complete the report and place it in the hands of the Publication Committee.

The subject was then passed.

Section IV. was called, and its report was read by the chairman, Dr. E. T. Darby. The subjects were discussed by Drs. Abbott, Allport, Daboll, Watkins, McKellops, Barrett, A. O. Hunt, Barker, F. Y. Clark, and Rhein.

Adjourned to meet at 9 A. M. to-morrow.

FOURTH DAY—MORNING SESSION.

The Association met at 9.30 A. M., the President in the chair.

The minutes of the previous evening's session were read and approved.

The special order, being the selection of the place of next meeting and the election of officers, was then proceeded with.

The following places were nominated:

Asheville, N. C.; Cresson Springs, Pa.; Asbury Park, Detroit, Chicago, Minneapolis, Long Branch, Lake George, and Saratoga.

Minneapolis was finally selected.

The election of officers was then had, resulting in the choice of the following:

President—J. N. Crouse, Chicago.
First Vice-President—M. W. Foster, Baltimore.
Second Vice-President—O. F. Rich, Saratoga.
Recording Secretary—George H. Cushing, Chicago.
Corresponding Secretary—A. W. Harlan, Chicago.
Treasurer—George W. Keely, Oxford, Ohio.
For members of the Executive Committee—L. D. Shepard, C. N. Peirce, and A. O. Hunt.

On motion of Dr. Odell the Treasurer was instructed to honor the draft of Dr. W. R. Clifton, of Waco, Texas, in case of his necessity, to the extent of two hundred and fifty dollars.

Dr. Allport rose to make a personal explanation.

The Executive Committee made their final report on credentials, which was accepted, and the report as a whole was adopted.

The Treasurer made the following report, which was accepted and referred to the Executive Committee for auditing, from whom it was returned approved, and was then adopted:

SARATOGA, N. Y., August 8, 1884.

The Treasurer respectfully submits the following report:

THE AMERICAN DENTAL ASSOCIATION IN ACCOUNT WITH GEO. W. KEELY, TREASURER.

1883.		Cr.	
August 10.	By balance on hand		$1,647 70
1884.			
August 8.	" dues received since last meeting		225 00
" "	" " " at this meeting		565 00
			$2,437 70
1884.		Dr.	
March 15.	Paid order of Chairman of Publication Committee		$25 00
August 8.	" Secretary's salary		200 00
	" reporter		125 00
	" balance due Publication Committee		8 03
	" Treasurer's salary		100 00
	" " expense—new books, postage, and express-age		19 11
	" M. L. Rhein, of Committee of Arrangements, for use of hall, etc		77 40
	" F. M. Odell, Chairman of Committee of Arrangements, for printing, etc		88 21
	" expense of transferring accounts to new books		25 00
	" for use of table at this meeting		1 00
			618 75
	Balance on hand at this date		1,823 95
			$2,437 70

August 8, 1884. Audited and approved.

J. N. CROUSE,
A. M. DUDLEY, } *Auditing Committee.*

The Executive Committee reported that they had audited the accounts of the Treasurer and Publication Committee and found them correct.

The report was accepted and adopted.

On motion of Dr. Odell the following were adopted:

Resolved, That the thanks of this Association be tendered to Mr. Henry Clair, of the Grand Union Hotel, for his exceedingly generous treatment of our friend and brother, Dr. Clifton, in his present necessity, and also for his liberality in making a reduction to our members in the rates of his hotel.

Resolved, That this Association desires to express its thanks to the various railroad corporations who have favored us by reduced fares, and by other courtesies.

On motion of Dr. Shepard the following was adopted:

Resolved, That the thanks of this Association be tendered to the Local Committee of Arrangements.

The installation of officers was then proceeded with, and the Chair appointed Drs. Peirce and Abbott to conduct the newly-elected President to the chair.

The retiring President introduced him to the Association, and bespoke for him the same forbearance and courteous treatment which had been accorded to himself.

Dr. Crouse upon taking the chair thanked the Association for the honor it had conferred, and pledged himself to preside with impartiality over its deliberations.

A communication was read from the New Jersey State Dental Society touching a petition for the pardon of Dr. Chalfant.

On motion the communication was respectfully returned.

The President appointed on the Publication Committee Dr. A. W. Harlan and Dr. E. T. Darby, and on the Local Committee of Arrangements Drs. A. T. Smith, of Minneapolis, F. H. Gardiner, of Chicago, and H. J. McKellops, of St. Louis.

On motion the subject of operative dentistry was passed.

Section V. being called, was discussed by Drs. Abbott, Peirce, and Spalding.

On motion the Section was passed.

The minutes were then read and approved, and the Association adjourned to meet at Minneapolis on the first Tuesday in August, 1885.

GEORGE H. CUSHING, *Secretary*.

IN MEMORIAM.

THOMAS L. BUCKINGHAM.

WHEREAS, Since the last meeting of this body the all-wise Author of our being has in His inscrutable wisdom taken to Himself our highly-esteemed friend, professional brother, and co-laborer, Dr. Thomas L. Buckingham; and

WHEREAS, Not only this Association but the entire profession of this and other countries will have suffered by this dispensation an irreparable loss; therefore

Resolved, That we deem it fit and proper to give expression to our high appreciation of his personal worth, and of our regret that one who was so essential to the true interests of the profession should have been summoned to higher councils. Yet, while bowing to the will of Him who doeth all things well, we cannot refrain from giving expression to our feelings of sorrow that he should have been removed from among us.

Resolved, That we will treasure his past counsels and profit therefrom.

Resolved, That these resolutions be placed on a memorial page of the proceedings of this body, and copies be sent to the family of deceased and to the dental journals; and that a photograph portrait of the deceased be placed on the Secretary's minutes.

Dr. AMBLER: It has been my pleasure, for the last third of a century, to have been on terms of intimate relationship with Dr. Buckingham, and during that time there was with him one ruling passion, and that was the advancement of his profession. He loved his profession and his professional associates, and was ever ready to do all that he could for both. The entire surroundings of his office, as well as his counsels, were always freely at the disposal of all that would profit by them. It was my pleasure, a few years ago, to be associated with him in some matters connected with an investigation then being conducted, in which personal considerations would naturally protrude themselves; but, said he, "Do not let the personal matter be as your finger's weight in its influence on your consideration of this matter." He was modest and unobtrusive in his opinions; but when they were formed, they were firmly fixed as a rock. He was in all respects a man who commanded our love,

honor, and respect; and now that he has gone we can but mourn his loss. I trust we may all profit by his writings and his life, and so keep alive his memory in our hearts.

Dr. STOCKTON: There are few men in the dental profession for whom I have a higher respect and deeper love than I had for Dr. Buckingham. It is to him I owe very much of my success as a dentist; for it was by his advice that I was induced to close my office, after some years of practice, and go to the Pennsylvania college. It was the wisest and best thing I ever did in my professional life. Dr. Buckingham was ever a kind counsellor and good friend; he was almost a father to me, and I could only wish that I might hold as high and estimable a position in the hearts of my friends as Dr. Buckingham does in his. I wish I might go to the end of my professional life as he did,—you remember how he came here last year, with tottering steps and feeble form, to close his existence as honorably and usefully as he had ever lived. I support with heartfelt sympathy the resolutions which have been offered.

Dr. TAFT: No one knew Prof. Buckingham but to entertain for him a high regard. I suppose there is scarcely a man in the profession—and no one especially who has been in such a position as he has occupied for a quarter of a century—who has maintained his standing better in the estimation of his fellows than Dr. Buckingham. The high esteem which each one entertains for him will find a response in the minds of all with whom he may speak about him. This is true of Dr. Buckingham to a greater extent than of perhaps any other man in the profession whom I now call to mind. What he did for the profession was done with a sincere, earnest desire for the best results. He maintained an enthusiasm in the work which had occupied his professional life—namely, that of education—up to the end of his career, an enthusiasm that it seems to me has been unparalleled. At the last interview I had with him he seemed as earnest and as intensely interested in the subject of education as he did in the years gone by. Even when he was laboring under the disability of disease, and well-nigh broken down, under circumstances which would make the rest of us forget these things, they were upon his mind, and interested him as they had always done.

What he has done for the profession is incalculable. I wish I could feel that the work I have done was as out-reaching as that which he has accomplished for the profession, and that we all might have an ambition to serve our profession as he had.

In attempting to frame those resolutions, I felt how utterly unable we were to say anything that was at all comparable to that which ought to be said for this man; but I know that in the heart of every one here there will be a free response to what has been said; and the shortcomings of the resolutions will be supplemented in the esteem and high regard which are entertained for our friend by every one who knew him, as well as by others who shall hear of him.

Dr. ALLEN: Having been acquainted with Dr. Buckingham for many years, and having met him under various circumstances, I most heartily indorse all that has been said with reference to him on this occasion; and I hope that we shall ever cherish in our hearts a fond remembrance of that noble man.

Dr. FRIEDRICHS: As I am from the other extreme of our common country,—from the South,—I think it is my duty to add a few words in memory of our honored fellow and brother, and to express the sense of loss that we must all feel at his departure from us. Dr. Buckingham's reputation was not a local one. He was loved and esteemed from one end of this country to the other.

Dr. SHEPARD: As coming from the other extreme from that of the last speaker, I feel that it is a privilege to bear witness to the estimation in which our friend was held in the Eastern section of the country, and also to express for myself the respect and admiration which I always felt for him, as a sturdy, upright, true man and good friend. It is personally a matter of regret to me that I did not see him last year. He was one of the few of the older members—so much older than myself that it actually used to seem disrespectful at first—whom, when we met at our annual meetings, I would take by the hand and call by his first name. He would tap me on the shoulder and say, "That sounds real nice." Such was our pleasant relationship that it is a particular sorrow to me that we shall see him no more among us.

Dr. SEARLE: I want simply to express my feeling of personal loss in the death of Dr. Buckingham. I thought when I heard of his death that one of the most loved members of our profession had left us. I know of no one, much as I love and respect the dentists of Philadelphia, to whom I would sooner pay my respects when I visited the city than to Dr. Buckingham. My feelings have been well voiced by those who have spoken before me, and I could say no more if I should speak at greater length.

ANNUAL ADDRESS.

BY E. T. DARBY, PRESIDENT.

GENTLEMEN OF THE AMERICAN DENTAL ASSOCIATION:

A quarter of a century ago a company of representative American dentists, duly appointed by local societies, assembled at the Falls of Niagara to consider the desirability of organizing a national dental association. That Association was formally organized the following year in the City of Washington, and it has held, with the exception of a single year, annual meetings until the present time.

It was named the American Dental Association. The object was, "to cultivate the science and art of dentistry and its collateral branches, to elevate and sustain the professional character of dentists, to promote among them mutual improvement, social intercourse and good feeling, and collectively to represent and have cognizance of the common interests of the dental profession."

Of its original members a few remain until the present time, honorable representatives of their local societies, faithful to the Association which they helped to organize, regular in attendance at its annual meetings, and taking an active interest in all that pertains to its well-being. Others, by reason of advancing years and physical infirmities, are prevented from attending these annual gatherings; and others still, both in the prime of life and at the allotted period of man, have finished their work on earth, and have passed through the narrow portal which separates the things seen from the things eternal. Hardly a year passes that we are not called upon to record the death of one or more of our members. To-day it becomes my sad duty to make public announcement of the removal of another.

All who were present a year ago will remember the feeble health and the tottering step of our departed friend and co-laborer, Dr. T. L. Buckingham, and I am sure this Association will take mournful pleasure in making suitable record of his worth. Dr. Buckingham

was one of the original members of this Association, and from its organization to the time of his death was rarely absent from its annual sessions. Affectionate in disposition, genial and generous in his intercourse with others, modest of his attainments, and yet earnest in his opinions, he was one whom we honored as a dentist and loved as a man.

To those of you who have survived the "shocks of time" these twenty-five years have seemed to pass with lightning-like rapidity, and you are prepared to say, with the ancient Judean king, "My days fly swifter than a weaver's shuttle." To others of us who cannot claim so many years of active service, some of these are but as years of recorded history. As travelers on the busy highway of life, it is sometimes profitable for us to loiter for a moment and count the milestones that we have passed, and review the progress that has been made.

What stupendous events have transpired since this Association was organized!—events affecting us as a nation, as a profession, and as an association. Almost a generation has passed away; the infant child has become the stalwart man. The population of the United States has increased from thirty to fifty-seven millions. A terrible civil war has been fought, and enemies have become friends. The Atlantic cable has been laid, and the electric spark is darting from continent to continent. The Pacific Railroad has been built, and the locomotive whistles from Maine to the Golden Gate. Our country has celebrated its National Centennial, and we are elated with laudable pride because we have been honored by all the nations of the earth. The electric light, and telephone, and phonograph have been introduced, and the arts and sciences are proclaiming each day new discoveries. Colossal strides have been made in the matter of education. Our colleges and public schools have nearly doubled. Woman has been emancipated and her social status transformed, and new avenues to usefulness and eminence opened to her.

Nor have the changes in our profession been less great. Look for a moment at its growth. In 1859 there were less than four thousand practicing dentists in the United States. Now there are more than twelve thousand. Then there were less than twenty dental societies; now there are one hundred. Then there were but three dental colleges in America; now there are twenty, including universities which have dental departments. Then not a single State had laws regulating the practice of dentistry; now no less than twenty have legislative enactments, with penalties attached

for their violation. Then the literature of the profession consisted of a few text-books upon dental subjects, one or two monthly or quarterly journals, and the occasional published proceedings of a few dental societies. Now we have a creditable number of works upon dental subjects; no less than twenty periodicals, of which twelve are monthlies, seven quarterlies, and one annual; and in addition thereto, the published proceedings of several State societies, which constitute, not infreqently, the most valuable additions to our literature.

Such, in briefest outlines, has been the numerical growth of our profession. But numerical growth is not always progress. It has been thought by many that the rapid increase in the dental profession has been a detriment rather than a blessing to the public, and complaint has often been made that the dental schools have increased too rapidly, and the number of graduates sent out therefrom has been greater than the demand for them. This rapid increase in the number of schools shows, at least, an interest in the matter of dental education; but, while schools are organized and conducted as they are, there is one serious objection to further increase, namely, the want of adequate support. So long as dental colleges are dependent upon the fees of students for their support, so long will there be a tendency to increase the number of matriculates, irrespective of the qualifications of the men who apply. The only proper way to determine this matter of fitness would be by a rigid, uniform, and systematic preliminary examination, and even then the difficulty would not be entirely overcome, for the reason that examinations do not and cannot well embrace all the qualifications constituting fitness for entrance upon the study or practice of dentistry. The candidate for entrance upon a course of dental education may be intellectually endowed, and yet be wholly wanting in those mechanical qualifications which are so essential to a successful practitioner. Dentists, like artists and poets, are born, not made.

What the dental schools of America most need is endowments adequate to their support, rendering it possible for the professors and teachers in such schools to give their entire time and energies to the thorough instruction of the students in attendance; but it is hardly to be expected that such a happy condition of things will be brought to pass in the near future. Would it not be better, then, to have fewer schools, larger attendance upon each, and better facilities for instruction?

If the dentists of America would contribute five dollars each per

annum for five consecutive years, a fund could be raised sufficient to erect suitable college buildings, leaving enough for the endowment of five professorships, and, with the help of the fees received from students, make an income sufficient to enable each professor to devote his entire time to instruction. Such a school, or a number of such schools, located in the larger cities of our country, where the supply of clinical material is practically inexhaustible, governed and controlled by a board of trustees selected from among honorable men in the profession, or perhaps appointed by State societies, would certainly command the confidence and respect of the profession.

The tendency at present seems to be the establishment of dental departments in connection with universities or medical schools, and where such institutions are located in or adjacent to large cities, from which to draw a large clinical supply, and where the parent school is able to bear a large share of the expense and contribute to the facilities for instruction, such a union seems to promise well; but such a wedlock demands a thorough appreciation of the relationship which dentistry sustains to general medicine, and is based upon the belief that dentistry is a specialty of medicine. If this be true, it seems to me that at no distant day such schools should demand the same qualifications which entitle the candidate for graduation to the single degree of medical doctor; not that such qualifications are absolutely essential to the intelligent practice of the dental specialty, but because of the increased culture which such a course would afford.

The dental schools of America have just cause for pride when they survey the immense strides they have made during the past quarter of a century, and it is but just that we, ever and anon, make public mention of the valuable service which has been rendered to the cause of dental education by many connected with these schools. From the first, and even until the present day, their work has been largely a labor of love, without adequate compensation for the time spent in teaching, and, often with *no* pecuniary reward, they have labored on, and frequently contributed from their own scanty income to meet the expenses which they assumed in the management of the school.

While this Association has been quick to recognize any apparent shortcoming on the part of those engaged in college work, it has not always been as ready to speak encouraging words to the pioneers of dental education, and some have gone to their graves feeling that

they were doing a thankless work. It must, however, be said to the credit of this Association that it has from the first encouraged greater requirements on the part of the colleges, and has adopted resolutions making it obligatory as a condition of representation here that all schools shall demand, as one condition of graduation, attendance upon two full courses of lectures.

It is a pleasing augury for the future that a meeting of the faculties of the various dental schools has been called to fix upon a uniform standard of graduation; and it is to be hoped that within another year the candidate for a dental degree must have spent at least two years, or attended upon two full courses of five or more months each, in a reputable dental school, before being eligible to graduation.

Another cause for congratulation, and one indicative of real progress, is to be found in the fact that so many States have enacted laws regulating the practice of dentistry within their borders. The law is primarily to protect the public, and as most of them are framed will accomplish this object; but it does more,—it provides that State societies shall appoint boards of examiners, who are, in a certain sense, dictators. These boards not only have the power to decide whether non-graduates are competent to practice, but one of them at least, in the State of New York, ventures to say whether the graduates of certain colleges shall be allowed to practice within their commonwealth. And this is as it should be. If dental schools are lax in their requirements, and men seek such schools because of their disregard of requisite fitness, and graduate therefrom, the State should step in, and through its examiners and censors compel such men to give evidence of their qualifications before entering upon the practice of their specialty. In order to be efficient, however, these examining boards should be as thorough in their examinations and as rigid in their requirements as are the faculties of dental schools; otherwise the certificates from the examining boards will be often sought instead of a well-earned diploma from a reputable school. So far as we have any personal knowledge in the matter, the examinations of the various boards have been all that could be desired in this direction, and the testimony of some who have tried both has been that they are alike rigid. It does not seem right, however, that examining boards should have the power by sanction of the State to grant degrees, for, by so doing, it is putting itself in competition with dental colleges, and yet condemns these very colleges for granting diplomas without previous attendance upon the curriculum prescribed.

Another evidence of our progress is to be found in the improved character of our literature. It was formerly said that all of the original scientific work of the profession was done by our friends on the other side of the Atlantic, and that the American dentists were celebrated only for their manipulative skill and mechanical appliances. While such a statement would have contained much of truth in it a quarter of a century ago, it cannot be said of the profession in America at the present time.

The scientific work that has been done by American dentists during the past decade will compare favorably with that done by any other class of professional men, either in this country or Europe. One has but to read the original articles in our dental journals and the papers contained in the proceedings in our State and local societies, and of this Association as well, to be convinced of the truth of that assertion. Were it not for the bread-and-butter side of life, and the mad rush to become rich which in such a remarkable degree characterizes the American mind, our own profession would come to the front with greater evidence of the attainments which lie dormant within it. It is not so much the capacity to do scientific work which we need in America as it is the time to do it thoroughly.

The editors of dental journals complain that it is with the greatest difficulty that they can procure original articles for their magazines, and they are frequently compelled to publish inferior papers because the men who are competent cannot find time to devote to literary or scientific work. Notwithstanding this, our journals show from year to year marked improvement, and new text-books are frequently being added to our list of publications.

Our progress in every direction during the past quarter of a century is proverbial, and American dentistry, because of its excellence, is known wherever civilization is to be found.

But what relation has this Association sustained to the dental profession during the period of its existence? It was organized for an object, and that object is set forth in article second of our constitution. It was intended to be national in character, embracing in its membership worthy representatives from all sections of our country. In its earlier years political differences prevented the coöperation of the dental profession residing in the South, and although these barriers which once existed have been nearly or quite removed, we have never had the sympathy and support which would have been so agreeable from the Southern States.

While the growth of the Association has been gradual, the attend-

ance of its members has been fickle. It is with regret that we are compelled to say it has not received at all times that support and encouragement which it has deserved. Why that sympathy and support have been withheld it would be difficult to tell. Its aim has been to advance the interests of the profession in every possible way, and the work which it has accomplished has been such as to command the respect of all. In seeking for a cause of this dearth of interest we naturally turn first to its organization, but a careful scrutiny of its constitution fails to reveal any apparent defect. Its condition of membership is certainly not unreasonable. It has ever manifested the most liberal spirit, and has received into membership all worthy delegates from local societies. Nor has it been intentionally lax in its requirements. Occupying, as it has, the most critical place in the profession, it has endeavored to maintain a dignified and honorable attitude with relation to other societies. Fault has sometimes been found with its plan of membership, some contending that an association seeking to be national in character, and made up of delegates from State and local societies, ought not to have a permanent membership, but should be simply a delegated body, changing from year to year, as these societies may elect. Whether such a plan would work better than the one now in existence could only be determined by experiment. Complaint has also been made that our present methods are faulty, and that the Association cannot accomplish its maximum of good until others are adopted. Most present are probably aware that prior to 1879 the work of the Association was under the management of standing committees, and, while these seemed to accomplish much, there was an earnest desire on the part of some that a new method should be adopted. Accordingly, the plan in vogue in the American Medical Association was suggested. The permanent membership of the Association was divided into Sections, comprising seven, each having its chairman or head, and the work of the Society was to be done under these seven Sections. While many of the older members were in favor of this change, there were others who opposed it, and only consented to it with the understanding that it was to be an experiment, and that, if not satisfactory in its results, there should be a return to standing committees. Perhaps it is yet too soon to express a positive opinion as to the wisdom of this change, but your President is not alone in the belief that the Association has not accomplished as much under its present system as it did under the old one of standing committees.

Perhaps there are other reasons than the one just mentioned why

the Association has not been as successful in its work as could be desired, and were your President asked to indicate some of the causes of failure, he would ascribe it primarily to the profession at large. While there is a fair percentage of representative men who are constant in their attendance and faithful in the discharge of their duty, there is still a larger percentage who attend but seldom and who seem to take no active interest in the work of the Association. This latter class constitutes the complaining element which is so damaging in its influence. They will not work themselves, but are ever ready to criticise disparagingly the actions of others. It might justly be denominated the "dog in the manger" element. There is still another class who seem to take a semi-interest in the Association. They allow themselves to be appointed as delegates by their local societies; they come late, attend a few of the sessions, and take their departure early. How frequently it has happened that the sessions of the last day have been rendered unprofitable because of the absence of the majority of the members. It has been urged by some that our time for meeting is unfavorable; that we convene at a season of the year when our physical and mental energies are at the lowest ebb, and that, were we to hold our meetings at another season of the year, the attendance would be larger and the activity greater. The difficulties attending a change of this kind are of such a serious nature that few, I think, would be in favor of it. Men who are engaged in active practice cannot well leave their homes at other seasons of the year, and, although cooler weather might be conducive to greater mental vigor, the danger is that our attendance would diminish rather than increase.

Gentlemen of the American Dental Association, permit me to say in conclusion, and with none other than the kindest motives, that the needs of this Association can be embraced in one comprehensive maxim,—more honest work; less carping criticism.

SECTION VI.

PATHOLOGY, THERAPEUTICS, AND MATERIA MEDICA.

Supplemental Report on Treatment of Pyorrhœa Alveolaris, with Notes on Eugenol and Sanitas Oil.

BY A. W. HARLAN, CHAIRMAN.

NUMEROUS letters of inquiry asking for more specific details of the treatment of pyorrhœa have shown the widespread interest in this subject which has been awakened by recent contributions to dental literature. These evidences of a desire to accomplish all that is possible by any method of treatment advocated have induced me to continue my labors in this direction. The experimenter must have a genuine enthusiasm, combined with patience and intelligence. The reawakened activity in seeking to restore loose teeth to firmness in their sockets has shown that a new method of treatment was eagerly sought after to control the ravages of the disease under discussion. The writer is gratified to know that his efforts in the past have been so spontaneously recognized, and he here desires to express his acknowledgments for the words of encouragement so freely conveyed.

The mass of the profession are so likely to confound with pyorrhœa alveolaris salivary deposits on the lower incisors, or such deposits on the buccal, palatal, or lingual surfaces of molars, that it seems necessary to restate the fact—apparent to all close observers—that salivary concretions are only in slight degree, strictly interpreted, the cause of or associated with pyorrhœa, except as shall be hereafter alluded to. In many incipient cases a careful examination discloses the fact that there is only a slight recession of the gums surrounding the necks of affected teeth; in others none at all. In those cases recognized to be of longer standing may be observed a blunting of the septum of gum lying between the teeth, with a tendency on its part

to bleed on slight provocation, especially between the molars and bicuspids. In all cases where the discharge of pus is abundant on pressure being applied, the loss is observed of more or less of the bony process surrounding the root of the tooth, its symmetrical outline disappearing irregularly. This accounts for the varying depth of the pockets. Where the process is thinnest normally there will be found the most extensive destruction of bone.

Pyorrhœa alveolaris is not a disease of old age any more than it is a disease of youth or middle age. I have seen it in at least one case as early as the ninth year, and several times before the sixteenth year. From the number of cases of true pyorrhœa recognized up to this time I am unable to say at what period of life it is most frequently observed. My personal experience leads me to think that more cases are to be found between the ages of twenty-five and forty-five, but I have no reliable data to establish this. The thoughtless and ignorant extraction of teeth by those not competent to observe, neglect to consult a dentist at the proper time, failure to impress those persons suffering with pyorrhœa by the dentist into whose hands they intrust themselves, lack of means to secure proper attention at the right moment, and other causes not necessary to enumerate, all tend to prevent even an approach to the truth. It is to the future that we must look for statistics of age, sex, and the condition of the general health, the teeth most likely to be affected, etc. Pulpless teeth, even in the few cases I have seen, do not escape its ravages. Users of tobacco are not less liable to suffer than those who do not habitually use it. The worst cases I have seen were those where tobacco had never been used. Long-crowned teeth, slender teeth, teeth with small necks, and teeth which have been separated by files and disks and not properly cared for afterwards, teeth pretty generally free from extensive caries, teeth of mouth-breathers, are the ones most liable to be affected by pyorrhœa. Teeth which have lost their antagonists early are not often affected. After the inception of the disease teeth which are normally even and regular in their appearance change position, become twisted in their sockets, spread laterally, protrude over the lower lip (the central and lateral incisors) and if a tooth should be extracted through thoughtlessness or ignorance, the contour of the mouth may be changed. The teeth may even overlap each other, or a tooth may be pushed out of line. It is not possible without taking too much space to say how many deviations of position have been observed.

The fact cannot be too strongly reiterated that the vast majority

of cases of pyorrhœa are seen uncomplicated with salivary deposits. The writer is supported in this view by such observers as Black, Ingersoll, Witzel, Walker, and others who are well recognized as authorities. I have seen, in a number of cases, salivary deposits on the inferior incisors and on the buccal surfaces of superior molars, yet the remaining teeth were found free from such incrustations and still the patient suffered from true pyorrhœa. Several cases have shown a tendency to the deposition of salivary calculus on certain teeth while undergoing treatment. The dentist not in search of these cases will frequently be deceived by the appearance of the gums, as not many cases present an inflamed or thickened margin; few cases are to be seen where the *ligamentum dentium* has completely lost its hold on the neck of the tooth, and fewer still where the gums present a pale, flabby appearance. Many cases are seen where the gum has a purplish color, of various shades, corresponding to the outline of the pocket beneath. Pockets may be seen on the labial surfaces of the anterior teeth before the destruction of the alveoli has begun. This statement is based on the examination of cases known to be in their incipiency. The writer, having no desire to unnecessarily lengthen this paper, refers his interested readers to the undermentioned papers for various conflicting views on the pathology of pyorrhœa.*

I do not pretend to discuss the causes of pyorrhœa at this time. Later I may have something to communicate on that subject.

Treatment.

Instruments. Experience has shown the necessity for possessing three probes of extreme delicacy for examining the pockets: first, for their depth and width; second, for detecting serumal deposits on the roots, and third, to discover the condition of the edges of the alveoli. The probes should be smooth-pointed, so as to not lacerate or wound the gums. Previous to using them the mouth should be thoroughly cleansed by syringing it with tepid water, and the gums dried with bits of paper, fibre lint, or spunk. When the condition

* L. C. Ingersoll, "Alveolar Ulceration," Transactions Ill. State Dental Society, 1880. G. V. Black, "Phagedæna Pericementitis," 1882. A. Witzel, "Infectious Alveolitis," *Brit. Jour. Dent. Science*, Feb., March, 1882. J. Arkövy, J. Iszlai, J. Walker, W. H. Atkinson, Vol. III., Transactions International Medical Congress, London, 1881. A. W. Harlan, *Dental Cosmos*, October, 1883. G. A. Mills, *Dental Cosmos*, 1879, *et seq.*, *Missouri Dental Journal*, 1882 or 1883, and others of a more or less fragmentary nature.

of the gums, roots, and alveoli has been ascertained, the plan of procedure must be determined. When there are salivary deposits they are to be removed at the first sitting, and the patient furnished with:

℞.—Pinus canadensis (white), ℥ ss.
Aquæ rosæ, ℥ iijss.
Eugenol, ♏ xxx.
M.
Sig. Use thrice daily for six days on a badger tooth-brush.

If there are more than four teeth affected I do not as a rule attempt to remove the serumal deposits (if such are present) from all at the first sitting, but reserve them for the second appointment, which must be made on the fourth succeeding day. Then include the four following, and so continue until the whole number have been thoroughly treated.

The instruments for the removal of serumal deposits which please me best are known as Cushing's scalers (made by The S. S. White Dental Manufacturing Co.). I have added to my set several others, so that with ten or twelve instruments—all necessitating a *pushing* motion—I am well equipped for the removal of any deposit on the root of a tooth, or in the bifurcation of a root. In addition to the above, two or three small spoon excavators are necessary for scraping and excising the edges of the alveoli, when it is not possible to accurately bur the edges with an instrument run by the dental engine. Where the teeth are widely separated, instruments of grosser calibre may be used. An ordinary hypodermic syringe with any approved point is also necessary. There should be points of at least three differing angles, in addition to one straight one; these points should not be too sharp. I use one syringe for injecting H_2O_2 *exclusively*. Two syringes are all that any one needs. The pockets are injected with H_2O_2 immediately following the removal of the deposits and the excision of the edges of the process. Any guaranteed peroxide of hydrogen may be used. It should be kept in a cool, dark place, in a glass-stoppered bottle which has been covered with a dark-blue paper. One ounce is all that is necessary to keep in the case for daily use. Immediately following the injection of H_2O_2, I use almost exclusively iodide of zinc in solution of water—from three to forty-eight grains to the ounce,—beginning with the stronger solutions in the worst cases by injecting two to four drops in each pocket, and gradually decreasing the strength until the cessation of treatment. I have been using eugenol and sani-

tas oil, much diluted with oil of wintergreen or sassafras, in place of ZnI_2, but I am not yet ready to report on their effectiveness.

I direct the patient to refrain from brushing the gums with a stiff brush and from fingering or squeezing them during treatment. I discontinue the use of the Pinus canadensis prescription when I begin the treatment of the pockets. Loose teeth are wired together with fine binding wire (tinned); or silver, platinum, or gold wire may be used. The patient in the beginning is required to appear once in four days. When constitutional treatment is called for, which is seldom necessary, the patient is placed under such appropriate treatment as the case demands. The injection of H_2O_2 is discontinued when suppuration has ceased. I frequently prescribe for use at this time a dentifrice in the form of a paste, as follows:

℞.—Precip. chalk,
Powd. orris root, aa, ʒ ii.
White castile soap,
Powd. borax, aa, ʒ ss.
" myrrh, ʒ ii.
Honey and glycerin, q. s. to make a soft paste.
Color rose pink.
Perfume to suit.

To be used before retiring and after breakfast on a brush not dipped in water and not too stiff.

If desired or needed I add to the prescription twenty drops of eugenol. Generally this will be found a desirable addition. After the fourth or fifth visit the interval between appointments may be lengthened to a week, then to ten days, and finally to two weeks.

As elsewhere stated,* I have found that, in all acute cases of pyorrhœa associated with pain, iodoform made into a paste by adding oil of cinnamon or eugenol until of the consistence of thick cream is an excellent anæsthetic. It is used by packing the paste into the pockets, directing the patient to return in three or four days. I have had equally good results in painful cases from the injection of weak solutions of chloride of aluminium, one to three grains to the ounce of water. As soon as the inflammation has subsided these are to be discontinued.

I have no doubt that there are other equally useful remedies in this stage of pyorrhœa (iodo-chloride of zinc, chinoline tartrate, saturated solution of iodine in wood creasote, iodoform and eucalyptus, dilute alcoholic solution of menthol, etc.). However, from

* *Dental Cosmos*, October, 1883, page 517.

a long and persistent use of the medicaments first mentioned, up to date I give them the preference. During the period of consecutive treatment of these cases the patient must keep the mouth scrupulously clean and pay attention to correct rules of hygiene.

The practitioner who desires to succeed in curing pyorrhœa must be a heroic surgeon, and a faithful therapeutist. Lacking enthusiasm, not doing faithful work, or neglecting to impress the patient with the necessity for strictly following his directions, he must fail; but believing in the treatment he proposes, fully conscious of its importance, and patiently proceeding in the face of all obstacles, neglecting nothing essential, success will crown his efforts.

Eugenol and Sanitas Oil.

By request of Section VI. the chairman was deputed to present a brief statement of the properties and uses of eugenol and sanitas oil.

Eugenol is one of the active principles of oleum caryophylli, and is known in the Dispensatories and by chemists as eugenic acid. It is prepared by decomposing eugenate of potassium with sulphuric acid, and is afterwards rectified, when a colorless oil of the specific gravity of 1.076 is obtained. It has an odor of oil of cloves intensified, and possesses a sharp and penetrating taste. The chemical composition is $C_{10}H_{12}O_2$. It is not decomposed at ordinary temperatures, and has no tendency to become thickened by exposure to the air, or to precipitate a sediment. It may be diluted with water—which is preferable—or with alcohol. Its potency as a parasiticide is retained best in aqueous solution.

The dental uses of eugenol so far have been limited. When applied to an exposed or nearly exposed pulp the pain from exposure is greatly lessened and frequently ceases altogether after a minute or two. If the cavity has been washed with a solution of sodæ biboras previous to its application, it is probably the best dressing for a slightly inflamed or congested pulp that we possess, not excepting the various iodoform pastes. It may be injected through a fistulous tract and the root sealed at the apex immediately in all alveolar abscesses of recent occurrence, no further treatment being necessary; but it is imperative that the root should be thoroughly filled. I have injected two drops into the interior of an epulis and in three weeks the epulis had disappeared. As a dressing for root-canals after the removal of a recently destroyed pulp, it will and should supersede all of the powerful coagulators of albumen. Diluted with water—1 part of eugenol to 1000—it is an elegant and agreeable dressing in-

jected into the pockets of pyorrhœa, and may be substituted in that proportion for H_2O_2 in cleansing the pockets. With proper precaution it may be injected full strength into a blind abscess after it has been cleansed by using H_2O_2. In such cases the root-canal should be sealed loosely with cotton saturated with it. Other uses of eugenol will suggest themselves to those who are engaged in experimental therapeutics.

Eugenol in full strength will coagulate albumen. It is a powerful germicide, and not dangerous to human life, as the ordinary dose is much larger than would be used in treating a dozen abscesses at one sitting.

Sanitas oil is obtained by the oxidation of oil of turpentine floating on water by directing a stream of heated air on its surface. It contains camphoric acid and peroxide of hydrogen. The oil possesses oxidizing powers equal to a ten-volume solution of H_2O_2 and may be considered to be a convenient method of storing H_2O_2, as we have in this product a germicide of the first rank combined with a volatile oily dressing, which is disinfectant, antiseptic, and not poisonous. It is non-irritating and has an odor similar to fresh pine, which is not disagreeable. The odor may be disguised by adding the oil of either gaultheria, cinnamon, or sassafras. Eugenol or eucalyptus will not disguise the odor except in larger volume than the sanitas.

It has been used to inject pyorrhœa pockets; in the treatment of alveolar abscesses,—non-fistulous,—and as an ingredient of mouth-washes; for dressing foul ulcers, wounds, ulcerated sore throat, and as a dressing over exposed pulps, and for injection into abscessed antra. It is soluble in alcohol and ether, and some of the essential oils,—not readily so in the latter. My use of it has been confined to sixteen cases of various forms of alveolar abscess—so far with success,—and semi-occasional use of it in the above-mentioned list of diseases.

Both eugenol and sanitas may be procured in this country—Schuchardt's and Merck's eugenols are reliable, and sanitas is manufactured by the Sanitas Co., of London, England. Sargent of Chicago imports both preparations.

DISCUSSIONS.

Dr. ODELL: I wish to express my high appreciation of the paper which Dr. Harlan has just read. There is only one point where I

would take any exception to it. The doctor seems rather to disapprove of manipulation of the gums in the cases he has mentioned, and is in favor of letting the drugs do the whole business. I have had two cases myself, and quite important cases, too, and have participated in attendance upon one which Drs. Rhein and Bödecker had in charge, where the manipulation of the gum at a certain stage seemed to be about the only thing that kept up the reparative action. At least, until that was done there was very little progress toward recovery. We had in one case a molar that semi-occasionally resisted treatment, or seemed to get just about well, and then suddenly everything would break loose, and you could readily pass the probe quite to the apex of the root. Finally, we decided upon having the patient assist in the treatment by frequent manipulation of the gum. That was supplemented by the application of the galvanic current once in four days, and then the parts got well. All the drugs that we applied, however severe or however mild, did not seem to have the desired effect upon that particular locality. The conclusion that we came to was that it was a sort of neurosis, and that electrical treatment would be the thing to help us out of the difficulty. Some experiments are now in progress by Dr. Bödecker looking to the establishment of that position. I will not attempt to give a synopsis of the theory, but will simply say that it seems to me so reasonable that I am satisfied to wait until Dr. Bödecker and the gentleman engaged with him finish their experiments and present it in their own manner.

Dr. Bogue: I would like to ask Dr. Harlan, if it is in order, why, at a certain stage of his treatment, he recommends the use of Canada balsam? and, also, why, at a certain stage, he recommends powdered myrrh? The questions seem to me important.

Dr. Harlan: In answer to Dr. Bogue's question, I would state that I said in the paper that the prescription was made for the purpose of washing the mouth and gums after removing the salivary deposits, and was discontinued when the systemic treatment of pyorrhœa proper was begun; so it was not used in the treatment of pyorrhœa at all. That much with reference to Canada balsam. With reference to the myrrh in the paste, the quantity is so small that I presume it might be left out. Perhaps there was no particular benefit to be derived from it, but it disguised the taste of some other things,—borax, for instance,—that would be disagreeable to some people. The chief object was to make it a paste instead of a powder, as I have found that in that form it was less liable to lodge

around the necks of the teeth, and that the patient would wash his mouth and teeth more thoroughly.

Dr. BOGUE: It has seemed to me that if, in these cases, it is necessary so carefully to remove all deposits from the roots of the teeth before commencing either constitutional or active local treatment, it is entirely unphilosophical to use, among other agents, those that must in the very nature of the case produce deposits. The substances mentioned are precipitated by water, and the effect of them must be to render the teeth sticky by just so much as they are used, if my understanding of the matter is correct. Perhaps I am in error in supposing that there is a discrepancy between the doctor's statement and his practice, and if so, I would be very happy to be corrected. I have noticed for many years that gentlemen of our profession have a tendency to prescribe tincture of myrrh and such things, which I could never understand the use of.

I wish to express my profound thanks to Dr. Harlan for his admirable paper, for his researches in this matter have certainly been of benefit to me, and I believe also to others.

Dr. HARLAN: I would like to ask Dr. Bogue if he ever used a tooth-paste in which there was a small proportion of myrrh.

Dr. BOGUE: Not consciously; I use glycerin instead.

Dr. HARLAN: I have used this paste myself, and have not been conscious of any deposit of myrrh on my gums; at least, none which would remain. I think with a paste the patient is much more likely to brush and rebrush his teeth than with a powder. Patients tell me so, and I believe it to be true. I have seen several hundred cases of this kind, and if myrrh is not a good thing to put in this paste, I certainly wish to take it out. I have not studied the action of myrrh very closely, and don't know much about it. I supposed, however, that it acted in the nature of an astringent.

The PRESIDENT: I am sure this is a very interesting question, and I hope it will be thoroughly discussed.

Dr. BARRETT: With the exception of dental caries, I suppose there are none of the oral diseases which the dentist is or should be called upon more frequently to treat than this disease of pyorrhœa alveolaris. I have listened with interest to what Dr. Harlan has said on this subject, and I have read with interest what he has written. I am expectantly awaiting the presentation of his promised paper upon the etiology of this disease. Until we understand the causes which produce it, we shall not be prepared to enter upon an intelligent course of treatment. What are the pathology and

therapeusis of this disease? Is it an affection of the peridental membrane? Is it a disease of the soft tissues, or is its seat in the osseous structures? Is it local or constitutional? Is it curable or incurable? Does it demand surgical or merely medicinal treatment? If it be confined to the peridental membrane, one course of treatment will be indicated. If it be something entirely dependent upon the superficial deposits upon the tooth, then a different treatment may be called for. The cases which have afforded me the greatest anxiety have been those in which there was certainly an affection of the alveolar process, if indeed such is not the fact in all cases. I have found in these instances that a simple removal of superficial deposits, and the application of astringents, cauterants, or any other class of remedies, was not sufficient. It did not reach the foundation of the disease. I have had some cases that have seemed to be extremely obstinate. In one of these I performed frequent operations, until I feared I must remove all the alveolar wall before I succeeded in arresting the course of the disease. My own treatment has been, in all obstinate cases, the removal of the edge of the alveolar process, because I believe the disease in such cases to consist mainly of caries of the border of the process. It might be termed alveolar necrosis, but for the fact that there is no regular sequestrum formed, although there is a wasting of the alveolar walls. Is that owing to peridental inflammation, or is it due to a disease in the bone—in the alveolar walls themselves? My own experience teaches me that in all serious cases the alveolar walls are materially affected, and that, until you have removed the carious portion and established a line of demarkation between the healthy and the diseased bone, no progress can be made in the treatment. When that has been done, and the superficial deposits have been removed, I have had no trouble, and all after-treatment has been simply incidental and palliative. Of course, I do not mean that I can cure every case that comes into my hands, but in the cases where I have been most successful I have noticed what I have stated.

To set up this line of demarkation, the agent that has proved most efficacious in my own hands has been chloride of zinc. I have used the iodide of zinc with happy effects, but the chloride is more satisfactory. We all know that there is scarcely anything in the range of our materia medica which so stimulates the production of new tissue. My main dependence, therefore, after the use of aromatic sulphuric acid, or something of that kind, has been chloride of zinc, simply as a stimulant to the formation of new bone.

Dr. ATKINSON: In what strength?

Dr. BARRETT: All strengths,—whatever the case in hand seems to require. I have used it in degrees varying from a saturated solution down to an extreme attenuation. The intelligent physician will adapt his remedy to the condition of the case. If it be a case where I desire a sloughing of the soft tissues or a complete breaking-down of certain elements, I inject a forty or sixty per cent. solution. It is only the personal experience of the individual which can guide in such cases.

Dr. ATKINSON: Very wisely did the Chair remark that this was a subject of great interest, because it involves the principles underlying the destruction, reorganization, and reproduction of the organic tissues. I think the value of every paper should be apprehended by the listeners and pointed out in their speeches, in order that in our communion together we may derive the greatest good therefrom. I am disposed to be complimentary, as others have been, to Dr. Harlan, and to thank him heartily for his able paper, and for the striking evidence of the exceeding faithfulness of his research, and for the lucid and liberal discrimination that he made, which did not seem to find a thorough lodgment in the minds of some of the listeners, when he said that there was a difference between the pathology of pyorrhœa alveolaris and of that species of destruction of the gum resulting from or compounded with the presence of salivary calculus or deposit. I think that is a point that did not find lodgment in the mind of Dr. Bogue, judging from the questions that he asked.

This mere preference for one article over another, in an empirical way, which has been touched, might be dwelt upon until we grow as gray as badgers, without taking one single step in that advance which should be the common purpose of us all.

Dr. Barrett touched the point precisely when he said that there was an important difference between an escharotic and a stimulant. I think he spoke more wisely or more profoundly than he would find a justification of in a critical analysis of his own remarks, or of what, by implication, might be derived from those remarks. Very few of us discriminate the difference between a stimulant, an escharotic, and a tonic. All these agents that have been spoken of have a direct influence to coagulate the albuminous portion of the tissues in the part, which produces as a result nature's own surgical dressing, so that by the operation of the functional law new tissues can be formed. But what is the process after this coagulation of

the albuminoid tissue occurs? It is a retrogressive metamorphosis of the layer of tissue immediately underneath that which has been coagulated. In the realization of this truth we find ourselves (a few of us who have studied this point) in advance of all the text-books in our understanding of the pathology and indications of the therapeusis of such conditions. The first step in this retrogressive metamorphosis is a return to the embryonal condition—that is, to that process which if continued would result in inflammation; but if it be carried no further than just to reduce the tissues to the indifferent condition that is called the embryonal or embryonic state, then there is a building up of the parts, by the action of the functional movement, that we call the production of new structure. When we shall have discriminated the difference between a cooking and a physiological hardening of the elements of the tissues, we shall be able to speak more learnedly and interestingly and understandingly and profitably about these processes that have so eluded the brain even of the best physiologists, pathologists, and therapeutists of the medical world.

There is one point with reference to which I think we should be more precise, and that is as to the strength of the escharotic that we are to use. That point was very unsatisfactorily covered by Dr. Barrett. He said he had not taken any measurement, and with him it was guess-so business all the way through. I have produced very satisfactory results by the use of twenty grains of chloride of zinc to the ounce of distilled water, and with that strength have been able to secure precisely the degree of coagulation of the albumen analogous to the coagulation that takes place in the evolution of the chick or any other embryon from any impregnated egg—that exact state of fibrillation of the lymph which is the first step in the construction of the tissues. What Dr. Barrett means by a saturated solution of zinc I confess I do not know. I have used as high as eighty grains to the ounce of water, but on the other hand I have made what I supposed to be a saturated solution of chloride of zinc, and have then found that I could keep on adding, *ad infinitum*, until I had a paste that was as thick as the best glycerin, so that there would be a thousand grains or more to the ounce of water.

Dr. BARRETT: Without the addition of hydrochloric acid?

Dr. ATKINSON: When I say water I mean water. If the gentleman supposes that when I say one thing I mean something else, he is entirely mistaken. I wish to be regarded and treated as if I was speaking the truth intelligently. If there is a distinguishing trait

in all that I say before this body, and have said from its origin until this hour, it is the endeavor to give my best thought, when it is only a thought, and to demonstrate it when it is concrete truth.

I have found that elixir vitriol and dilute aqua regia (one part to seven of water) are the best coagulants that I know of for that retrogression that is called waste of ligamentum dentium. That this is a local disease is proved to every man who is earnest enough in his desire to get at the truth to make his observations intelligently. It will sometimes start from the margin of the gum, from the point where the dental ligament is attached to the cement on the neck of the tooth, or sometimes from the end of the root, without involving enough to include the transverse process of the socket in which the tooth sits. The teeth most liable to these attacks are the cuspids. All who have studied the course of this disease, its diagnosis and prognosis, will agree, I think, that that must be a local expression of disease, at least. Whether there be a suggestion in that expression of an outside influence that has been lodged in the system, so as to admit of a debilitated condition throughout the entirety of the pabulum of the blood crasis expressed in that locality, I am not prepared to say. That is my thought, that it is only so very pronounceably local as that, when the disturbance in the blood crasis is so slight as only to be induced by some exciting circumstance in the affected region, such as the lodgment of a bit of fish-bone or something of that kind, which causes a breaking-down of the structure of the corpuscles that constitute this ligament at that point; and then the debility being centered at that point, the retrogression goes on by a chemical or physiological law, and thus we have those little pockets which are so familiar to us all. Wherever there is no deposit, either salivary, serumal, or sanguineous,—for these terms have all been used by gentlemen who have dwelt upon this question —then I seriously doubt the propriety of mechanical interference.

Let me define myself. My meaning is that I deprecate the use of an instrument other than an injection pipe or a syringe that will carry to the affected part these agents that I have spoken of; the compound tincture of aromatic sulphuric acid or the solution of the aqua regia of the strength indicated, to produce the coagulum that I referred to when I first took the floor—nature's scab—such as will grow anywhere in an abraded living human or mammalian tissue. You need not care about washing that away, because whatever there would be of extraneous deposits,—for instance, in the case of

the deposit of myrrh, at any point where there is water enough to take it out of its solution and precipitate it,—becomes part of the product of the retrogressive metamorphosis which goes on.

Dr. SHEPARD: I had some years since a case that has never been reported which may be of interest. A distinguished surgeon brought to me for consultation a patient whom he had treated for specific disease, but had been obliged to cease the exhibition of mercury three months before on account of what he considered ptyalism, and which he had been unable to arrest. He brought the patient to me to see if the teeth themselves had anything to do with the remarkable resistance to the ordinary modes of removing the salivation. He stated that he had, in pursuance of his custom, interrogated the patient in regard to the condition of his teeth before he commenced the mercurial treatment. His patient had recently had his mouth put in order by a prominent dentist, and supposed everything was in good condition. I examined the mouth, and found what I should have pronounced a case of pyorrhœa had I known nothing of the previous history of the patient. To what extent it was complicated by the specific disease and the effects of the mercurial treatment I could not tell, but I told the surgeon that I thought I could help him. He left the patient in my hands with the direction that whenever his gums were in good condition I should send him back. Pus could be expressed from the free margins of the gum, and the discharge was so profuse as to make a large spot on the pillow. I took the patient in hand, and with nothing but surgical treatment and a stimulating wash, which was the aromatic sulphuric acid diluted, syringed under the margin of the gum, I returned him to the surgeon in two weeks' time with the gums perfectly well. The surgeon then renewed the mercurial treatment without any recurrence of the trouble which he had been vainly combating for three months. The deposit under the gums, which in this case produced such extreme results, was very slight indeed, but was found on all surfaces,—labial, buccal, palatal, and lingual,—of all the teeth, and probably, disconnected from a specific disease and mercurial treatment, would not have attracted the attention of the ordinary dentist in his treatment of the mouth. Under the mercurial treatment what was so slight as scarcely to be called pyorrhœa developed into so acute a form as to produce this result, lasting for three months after the cessation of the mercurial treatment. The case is one of a number in my experience which lead me to continue in the belief which I have had for years, that this disease is largely due to an exciting

local cause, and is cured in a great majority of cases by a surgical operation, without any therapeutics at all except cleanliness. I have been much interested in the articles written by Dr. Harlan upon this subject, and in the paper to-night, and while I would not discredit or doubt the results that followed the treatment under his hands, I am willing to be put on record as still believing, as the result of my own experience, that a thorough removal of the accretions, with cleanliness and a slight stimulating application like the dilute zinc chloride or the dilute aromatic sulphuric acid, is all that is necessary for treatment.

We should take pains to impress still more strongly that salivary calculus and the deposit on the necks of the teeth which gives rise to this trouble are two different and distinct things. It is true that this disease is found in a pronounced form, or may be found upon every tooth in the head, where there is no salivary calculus whatever. It is true that the positions in the mouth where this disease is most marked are those positions where salivary calculus never comes, because the mouths of the salivary ducts are nowhere near. The palatal surfaces of upper molars and the labial and palatal surfaces of upper incisors and such positions in the mouth, which are distant from the mouths of any of the salivary ducts, are very liable to attacks of this disease. I am sure we all wish we could have more light upon its etiology. It is the one thing which we now need, and I do not remember to have seen anywhere any satisfactory explanation of the cause. Of course, until we get at that our treatment is empirical.

I have recently seen a case which I treated nine years ago, which was so extreme at that time that the patient could not masticate solid food. The lady is seventy years of age, and with the exception of two or three which I then considered hopeless has still all the teeth which I treated, and they are perfectly firm. In that case there was no treatment but a surgical removal of the deposits, and a slight therapeutic treatment, which was really a cleansing rather than a medication.

Dr. PEIRCE: It is not without extreme hesitation that I attempt to speak on this subject, and for the reason that the experience which I have had has led me to conclusions so adverse to those expressed by gentlemen upon the floor this evening, especially my friend Dr. Atkinson, a man who has been so accurate in observation and so profound in thought. I tremble in an attempt to controvert the opinions expressed by him. In common with other members of the

profession I have had many cases of what is termed pyorrhœa alveolaris, and I believe most emphatically that when conditions are found in the mouth like some of those recounted here this evening they are not pyorrhœa, but simply cases of local inflammation due to local causes, and such cases will yield readily to local treatment and get well. I believe that wherever cases have been cured by local treatment they are something different from the condition that I should term pyorrhœa alveolaris. I never yet have met with a case where urinary calculus existed that I did not find in the mouth of that patient to a greater or less degree this inflammatory stage. I therefore believe that this disease is more a local expression of a systemic condition. It is also found that the deposits from the urine in such cases correspond, to a certain extent, in chemical composition with the deposit found on the roots of the teeth. We find the disease more frequently, as has been stated in the paper, between the ages of twenty-five, or, you might say, thirty and forty-five. We find accompanying the disease, if not always preceding it, a calcification of the tubuli of the teeth, a filling-up of the pulp-cavities by calcification of the pulp. Then we find depositions of what has been termed sanguinary calculus, resembling tartar, upon the roots of the teeth, from the apical end up towards the neck. We find that the teeth are always indurated, and that the condition of induration precedes the breaking-down of the alveolar process. It precedes the exudation of pus from the alveolar socket. It precedes the inflammatory condition which we find in the gums. So much has been recognized by gentlemen who have studied the course of this disease. Efforts have, on frequent occasions, been made by gentlemen of our profession to stop its progress by drilling into the pulp-cavity and devitalizing the pulp, expecting by that means to stop the calcification of the teeth, and so stop the progress of the disease, but it has always been without avail. Treatment in my hands has been most effectual—not in curing the disease, because I do not believe it can be cured, but—in modifying its progress. I have never yet seen a case that has been cured, and I do not believe it possible to thoroughly cure a condition which I should call pyorrhœa, and which was the result of a systemic disturbance, but I believe that its progress can be stayed and the teeth saved and kept in the mouth for ten, fifteen, or twenty years by careful treatment. I could show gentlemen on this floor teeth in the mouths of four or five of my patients where, for instance, a central incisor had been partially dislodged and thrown forward until it was disfiguring.

This tooth has been carefully brought back into its socket, has been ground off so as to make it articulate properly with the opposing tooth, and by the use of wire strings, passed through holes drilled in the adjoining teeth and in the affected tooth, tied into place and held there for six or eight years. These teeth are still retained, but they have always been kept under treatment. Every three months at least the patient has come to me, and with dilute aromatic sulphuric acid the pockets have been thoroughly washed out by the use of a stick shaped into a little flexible spatula, upon which a few fibres of cotton were wound. In this way I have washed out the pockets and cleansed the neck of the tooth as far as the gum was loosened, and that has been the treatment for the last seven or eight years. I did at one time use the chloride of zinc, but latterly have found that the aromatic sulphuric acid has served the purpose better. I do not believe accumulations of tartar are the cause of this disease. I believe they accompany it by reason of a systemic condition, which predisposes and produces or occasions this deposition, which, by its presence, acts as the exciting cause to further stimulate the progress of the disease. I believe that the most successful treatment consists in a complete removal of all such exciting causes, and the keeping of the pockets cleansed out every two or three months with aromatic sulphuric acid, as just stated. In that way the teeth may be kept in the mouth for years and be made useful, while without that treatment they would be lost very much sooner.

Dr. RHEIN: I think the keynote to the lack of success in the treatment of this disease is lack of knowledge of its etiology. I can bear out Dr. Peirce as to the symptoms observed, but I have drawn other inferences from them. I have seen cases where after constitutional treatment was stopped there had been a recurrence of the pyorrhœa. It is an open question whether in such cases the recurrence is due to the dropping off of the constitutional treatment or to the neglect of the patient to keep the mouth clean. I think that when we find out about the cause of pyorrhœa we will conclude there are different forms of it.

Dr. FIELD: The assertion made by Dr. Harlan and strongly reiterated by my friend Dr. Shepard, that there was a distinct difference between the deposits accompanying pyorrhœa and salivary calculus, indicates that we ought to understand more about this difference than we now seem to. I understand there has never been made an analysis of the substance which is deposited around the roots of the teeth in pyorrhœa. We do know what salivary calculus is,

for that has been analyzed. But if we do *not* know what the deposit is which comes on the roots of teeth in cases of pyorrhœa, how do these gentlemen know that the substance deposited in pyorrhœa and salivary calculus is not one and the same thing. I feel more powerless in the treatment of this disease than of any other that comes under my care, while I think there is no disease which is of more importance to thoroughly understand than this. I have no doubt there are many others who like myself have found cases where it seemed impossible to tell where pyorrhœa began and salivary calculus left off. I do not believe we shall be able to do this until we have the analysis of the substance which is deposited in pyorrhœa. I think these investigations which Dr. Harlan has carried on have developed one of the most interesting subjects which could be discussed before this Association, and I am sure we shall all eagerly look for any new light that he or any others can give us in the future which will enable us to make correct diagnoses of such cases.

Dr. ODELL: I do not wish to show any antipathy to any special mode of treatment, but I do wish to call attention to some points which I think should be brought to your particular notice. The indiscriminate use of so strong an agent as aromatic sulphuric acid is almost certain, it seems to me, in the hands of even very intelligent practitioners, to frequently work a great deal of evil. I would not dare to use it in the loose way that some members of our profession seem to advise. I remember one patient for whom I applied aromatic sulphuric acid very faithfully for a time, and the case was progressing favorably; but owing to his objection to the length of time required—time which he could not afford to spare from his business—I allowed him to apply it for himself, with the result that the right central was denuded of its pericementum on one side of the root clear up to the apex. Had that been all I would not have minded it, that being a pulpless tooth, injured accidentally, from which not much could be expected anyway, but he used it for the other central, a comparatively healthy tooth at the beginning of the treatment; but before he got through and called upon me for inspection, he had succeeded in removing the pericementum from the neck of this tooth also, for a space one-sixteenth to one-eighth inch in width. My own experience in this and other cases leads me to be very much afraid of allowing patients to assist in the treatment. The chloride of zinc is worse, if anything, for if you are not very careful in the use of it, you are liable to have marks left. I

wish to call attention to these things, because I believe it is dangerous to go in too heavy on trying things before understanding their action, and because the younger members of the profession should never omit to supply the necessary "grain of allowance" when receiving instruction and recommendations from those older who never have failures.

Dr. PEIRCE: If I left the impression on this body that I recommend the use of aromatic sulphuric acid indiscriminately as a mouth-wash by the patient, I certainly left an unintentional impression and a bad one. I thought I said very distinctly that I used it on a stick or spatula, with a few fibres of cotton on the end. That is what I meant to say. In the case suggested by Dr. Odell, if the tooth was forced out of place by accident, as I should suppose from what he said it must have been, I would not consider it a case of pyorrhœa. I use sulphuric acid in pyorrhœa alveolaris in my own hands. I do not recommend my patients to use it. While I am on my feet I want to speak of the desire of the patient in such cases generally for acid drink. I never had a patient who was suffering in this way who did not crave acid drinks, and as often as they craved it I recommended them to use it in such form as would be agreeable to their taste.

Dr. ALLPORT: As Dr. Harlan has included in the addendum to his report what I said before the Section in regard to the use of eugenol in the treatment of exposed pulps and alveolar abscess, I will simply say that I have used it in a case of eruption on the face which had resisted the treatment of some of our very best physicians who make diseases of the skin a specialty, and with entire success, by the simple application of a one-per-cent. aqueous solution.

With reference to pyorrhœa alveolaris, it has been well said that there is a great difference between simple inflammation of the gums caused by the mechanical irritation of salivary calculus and this disease. The latter may be entirely from systemic or constitutional causes, and a large majority of incurable cases are from these sources; while inflammation of the gums from the accumulation of tartar is local, and needs little treatment other than the simple and complete removal of the irritating agent.

But pyorrhœa alveolaris is frequently found where the teeth are kept scrupulously clean. In fact, some of the worst cases I have seen have been in the mouths of my most careful patients; we must, therefore, look to some other than mechanical irritation for the origin in such cases. It must be systemic. In my judgment a very

large proportion of these cases are from uremic trouble of some kind, and I have observed quite generally that patients with pyorrhea were also suffering with some form of uremic trouble, and when relieved of the latter, the former disease yielded more readily so treatment.

No doubt bacteria aggravate and are largely instrumental in continuing all forms of pyorrhœa; but if its origin is systemic we must look beyond local treatment for its radical cure. We may palliate and greatly benefit by local treatment, but if the cause is systemic, without proper constitutional treatment the disease will recur.

Wherever we find pyorrhœa we find bacteria, and wherever we discover bacteria we usually find pockets made by them; and whether these micro-organisms excrete a substance that acts upon the alveolar wall analogous to that claimed in the decay of the teeth, may be questioned, though quite likely that may be the case.

In all forms of this disease mechanical treatment is necessary, and usually the local application of medicines will be found useful, and in their employment three properties are important. They should be capable, when necessary, of dissolving out the lime-salts of the diseased alveolar walls until healthy tissue is reached, as in the treatment of diseased bone in any other part of the body. They should have the power to destroy these micro-organisms and also be a stimulant to healthy action and the formation of new tissue.

Acids, some of the metallic chlorides,—such as tin, mercury, silver, and zinc,—and eugenol, possess some of these properties in various degrees. But they should be used intelligently, and with a distinct understanding as to their effects, and not empirically, nor because Dr. So-and-So used them.

Dr. JAS. TRUMAN: I feel like indorsing Dr. Harlan's paper on one point at least, and that is in regard to the deposits in pyorrhœa alveolaris. To my mind there has never been advanced a more absurd theory than that this disease is produced by deposits of tartar. I have endeavored to investigate this matter for the past fifteen or twenty years,—ever since the French writers gave it its present name. Now, it does seem to me that we do not get at this matter properly. What is pyorrhœa alveolaris? Is it anything more than a local irritation, aggravated by systemic conditions? I think not. Then it is nothing more than alveolar abscess translated from the apex of the root to the neck. In other words it is an irritation of the pericementum. That irritation may take place at any point. What is

the condition in alveolar abscess? Is it not inflammation of the pericementum, followed by absorption of the alveolar process? How is that absorption produced? By pus, which is recognized as being composed of white blood-corpuscles—leucocytes—which have wandered by emigration. Now, it was demonstrated years ago by von Recklinghausen that the white blood-corpuscle, examined in the living state, was a very different thing from what it had theretofore been considered. The changes of form that it undergoes are of the same nature as those of amœbæ and it possesses the same power of absorption and locomotion.

In proportion, then, as we have these amœbæ, wandering cells, or leucocytes,—whatever you choose to term them,—you will have rapid absorption of the tissues. What is the condition at the neck of the tooth? We have there irritation of the pericementum; then formation of so-called pus, which absorbs the alveolar process. Now, in my opinion, we need first, to treat the pericementum. As has been already stated, there results in the progress of the disease a large and increasing number of bacteria. All of you who have worked with the microscope, know that this term bacteria covers a great variety of forms. While retaining their original character in pyorrhœa alveolaris, they largely increase both in numbers and size and become a powerful irritating force. We can do nothing until we remove these by an agent capable of destroying them; then we can act on the surrounding tissues. We must have drugs for this purpose. The idea that has been promulgated, that you can cut and slash around the roots in such cases, is one of the barbarisms of dentistry. You cannot, in my opinion, remove the pericementum in that way and expect a renewal of tissue. There is no deposit there to remove. Why is not pyorrhœa alveolaris present in the posterior portion of the inferior teeth? Tartar is seldom absent; but this disease is rarely manifested there. Irritation begins at the neck of the tooth, and in consequence we find there an increased number of bacteria. They increase the irritation, and then absorption takes place, and so on through the whole process. All cases of absorption are not caused by pyorrhœa, however. As Dr. Peirce has truly said, this has nothing to do with the absorption of the pericementum in calcification of the teeth. It is the cessation of nutrition by closure of the tubuli; the destruction of the tissue goes on, through the operation of a natural law, and the tooth is thrown out as a foreign body.

A word in regard to treatment. I approach that subject with

some degree of hesitation, after the able remarks of Dr. Harlan. I agree with him fully in most that he has said; but I confess that I cannot understand how any gentleman can arrive at any degree of success with the use of aromatic sulphuric acid. I have found the best results in the use of pure sulphuric acid, which I am not afraid to apply, in reduced strength. I have followed that always with bicarbonate of soda, to neutralize the acid on the teeth. In my hands one application, when systemic influences are not operating against the treatment, has been almost invariably successful. To maintain the good results, I have been in the habit of prescribing a mouth-wash of thymol, and keeping that up continuously.

The treatment, then, should be, first to destroy bacteria; then, by the use of some irritant, to arouse new granulations, and then to keep the mouth in a healthy condition. I have found, recently, very great satisfaction in the application of a very common remedy, that I am not aware has been previously used for this purpose,—the sulphate of quinia. The effect of this is to inhibit the movement of the white blood-corpuscle and through its antiseptic property to destroy germs. Through this dual capacity it prevents inflammation. As I have only recently experimented with this agent I cannot, therefore, speak with any certainty of its value in extensive inflammations; but the results so far attained promise to give it prominence in the treatment of the disease under consideration.

Dr. SHEPARD: I wish to make a request of gentlemen who speak of treatment, that they be a little more explicit in stating just what the treatment is; and, if explaining the use of therapeutical remedies, that they state the strength of the remedies they use. A criticism was made last evening that sulphuric acid was a dangerous material. I said I used dilute aromatic sulphuric acid; that was indefinite. I should have been definite and stated that I use it in the proportion of one of acid to three of water. Hardly anyone who spoke last night was explicit in stating the strengths of the remedies used. The proportions should be so exactly given that we can intelligently follow the treatment recommended.

Dr. SEARLE: I would like to ask a question: In the first place, why use these various remedies for pyorrhœa which were named here last evening? I think we have not gone deep enough into the nature of the disease. We hear it suggested, sometimes, that decalcification and caries are synonymous terms. I should as soon think of saying that decalcification and pyorrhœa are synonymous terms. Both caries and pyorrhœa are diseases of the soft tissues.

The lime-salts have little to do with them, in my opinion. If I have rightly studied pyorrhœa it is a disease of the pericementum. It is set in action by some irritant. That irritant may be tartar acting mechanically, or it may be low organisms acting physiologically. But, whatever it is, inflammation is started in the pericementum, and it works itself far down between the alveolar wall and the cementum, often before it makes itself manifest at all. The disease has been in progress for a longer or shorter period before we know anything about it. Unless we can apply our remedies to the part affected, we might as well throw them upon the sidewalk. We all know that disturbances of the mucous membrane are not pyorrhœa. We know that inflammation of the pericementum in itself is not pyorrhœa. Now, when does pyorrhœa commence? At a certain stage of inflammation the pericementum itself becomes organically diseased. It becomes a changed tissue. You can hardly separate the changed pericementum from the cementum. In order to cure the disease we have to remove all foreign matter and diseased tissue; we have to go down to the point of union between the healthy and the unhealthy portions; we have to treat it as a disease and not as an injury; we have to recognize that this disease has its seat in the living membrane. The question is, how shall we reach that point most safely to the living cells. We all agree that all foreign substances must be removed thoroughly, so that the tissue may have a chance to live. After having performed a surgical operation I dress the wound as nearly antiseptically as possible, because I am told by those who ought to know that, in some cases, at least, it is a genuine germ disease, and as such needs antiseptic dressing. The best dressing with which I am familiar is full-strength carbolic acid, applied as Dr. Peirce said last night, far down at the point between the healthy and diseased tissue. Reach the seat of the trouble and apply your remedy there. If any germs are present the carbolic acid, full strength, will take care of them by coagulating the albumen of the tissue.

How about repeating that operation every few days, or every week or two? Let it alone most severely. Having once performed the operation, having once amputated your limb or your part, and having dressed it, let it get well. For the sake of the comfort of the patient, for the sake of your own satisfaction in seeing the tissues healed, give nature a chance to effect a cure.

Something has been said in regard to external friction of the gums. Probably it is the best way the patient can press out the

loose foreign substances that lodge between the gum and the root of the tooth, which, with the brush, can then be carefully removed. After which the mouth should be furiously rinsed with water.

Dr. STOCKTON: I understood, in the discussion last evening, one gentleman, very prominent in the profession, to state that this disease was a matter of deposit alone, and he left us to infer, at least, that it could be cured by cleanliness. Another said a saturated solution of a certain acid would cure it. Another gentleman, equally prominent, said there was no such thing as a saturated solution of that acid. I would willingly and gladly sit at the feet of any of these gentlemen and drink in wisdom from them, and yet from the discussion we have had I confess that I know no more about how to treat this disease than I did before coming. Some say it can be cured. Dr. Peirce, a very eminent gentleman in our profession, has said very distinctly that he does not believe that it can be cured. The only point that I would emphasize is this,—that we are greatly obliged to Dr. Harlan for what he has done in the direction of cure; but he has started, perhaps, a little at the wrong end, for, as Dr. Barrett wisely said last night, the etiology of this disease is what we wish to understand. When we thoroughly understand what the disease is, the mode of its treatment and cure will, I think, be readily determined.

Dr. R. FINLEY HUNT: I desire to take advantage of this occasion to return publicly to Dr. Harlan the thanks that I expressed to him last night for the pleasure that I derived from listening to his paper. There can be no doubt of the importance of this subject. If there had been any doubt it would certainly have been dispelled by the interesting and instructive discussion to which we have listened.

In investigating the etiology, pathology, and therapeusis of pyorrhœa alveolaris, if we follow out the path that is plainly marked for us, we will be led on from the examination of that disease as a merely local matter until we come into the field of dental hygiene. Following the continuation of that path, naturally we will be led into the broad field of general hygiene,—fields that, in my opinion, are so closely connected as to be inseparable. All local diseases are but local expressions of constitutional or general disturbance, determined towards the point of the locality by circumstances with which we are at present unacquainted. And we would not go far amiss, I think, in studying the etiology, pathology, and therapeusis of any local disease that comes under our care, if we were to commence at the beginning and look to the necessity for general consti-

tutional treatment. It seems to me that the observations of gentlemen who are eminent in our profession have established as a fact that those tribes and races of people who live simply, in accordance with the laws of nature laid down for the preservation of health, have teeth in better condition than those who live as we do, artificially. So that in investigating this disease we have to take into consideration the great laws of hereditary tendency and the habits of living, and if we can secure a good condition of general health, then these local diseases will be much more easily cured, if they do not disappear altogether. It is a maxim in medicine, that if the cause of a disease is removed, the effect disappears, and that is based on the principle which was so beautifully illustrated to my mind by Dr. Atkinson last night, when he said that medicines themselves do not cure! Medicines place the circumstances of the trouble in such a condition and relation, as regards the tissues, that nature with her recuperative powers is enabled to perform her beneficent work of rebuilding and reforming.

I desire to express an opinion with reference to a remark that was made last evening, which attributed the existence of pyorrhœa alveolaris to a diseased condition of the urinary organs, to the deposit of calculi in the blood, or to diseases of that nature. My own view is that both these diseases—the diseases of the urinary organs and pyorrhœa alveolaris and similar affections of the teeth—are the results of systemic condition, and not one because of the other. I have found a close relation between the condition of the teeth and gums and their ability to resist the attrition of mastication, and the state of the kidneys and the blood.

Dr. SEARLE: I forgot to say that my opinion with reference to the use of full-strength carbolic acid is based upon my own experience. I have had a number of cases where I have tried unsuccessfully to arrest the progress of the disease until I adopted that treatment. For six or eight years I have been pursuing that course of treatment with good results.

Dr. PEIRCE: I feel sometimes, when I am so misunderstood as I have been in this respect, that I have left unsaid things that I should have said, and have been understood as saying those things that I did not say,—I feel sometimes that I will never open my mouth again in a dental meeting. The impression that I meant to give last night was, that there are conditions of the teeth which we term pyorrhœa alveolaris which are due to systemic conditions.

I meant to say, further, that when there has been a deposition of

urinary calculus, so far as my own experience has gone, in every case I have found that condition of the mouth which we term pyorrhœa alveolaris. I did not intend to say that urinary calculus was the cause of the pyorrhœa. I do not believe that. I only meant to say that the systemic condition which resulted in the one, was equally the cause of the other. Hence, we may sometimes use the presence of the pyorrhœa as a means of diagnosing the presence of urinary calculus, or rather, the presence of pyorrhœa would be a sustaining feature in favor of urinary calculus. I said, further, that I did not believe a patient under such conditions could be cured without a change in the systemic influences which induced the condition. There are conditions which we term pyorrhœa which are simply the presence of pus in the alveolar socket, and that may be due to local causes. If these local causes are removed, the disease will subside. But when it is the result of a systemic condition, as I said last night, I do not believe it can be cured, unless that systemic condition can be relieved. I am strengthened in this conviction by the fact that it is very largely a hereditary tendency. I think that if we will make inquiry of our patients we shall find evidence of this,—indeed, we are often told without inquiry,—"My mother, or my father, lost all their teeth in that way. They all came out without decay." How many of you gentlemen have had your patients tell you that? I think many of you will bear me out in my conviction that it is a transmitted tendency. I do not mean that the disease is transmitted; but I do believe in the transmission of idiosyncrasies,—of tendencies which, given an exciting cause, will bring about the disease. I hope I have made myself understood.

Dr. WATKINS: I have had some experience in treating this trouble, and I would like to describe just one case. I understood Dr. Peirce last evening to say that he did not believe that, in any case, the real pyorrhœa could be cured. I have thought that I have cured pyorrhœa. I will describe a case similar to the one which Dr. Peirce described last evening. It was that of a lateral incisor, elongated, and pressed labially out of its position considerably. The pus was oozing out from all the surfaces, except a small space on the labial surface, and the tooth was very loose. I examined it, and found a very little tartar, about half way up the root. That I removed, and I also removed the edge of the alveolar process which was necrosed, until I got to healthy bone. I then applied aromatic sulphuric acid, full strength, and carried it up as far as I could into the seat of the trouble. Before I did that, however, I cut the tooth off

and trimmed it up to its proper shape, so as to correspond with the other teeth. I tied it with a platinum wire, and let it remain so. I made the same application in one week from that time, and then let the patient go, seeing her again in three months. At that time everything, except one place in the mesial surface, had a nice, healthy appearance. At that place, I supposed I had not removed all the necrosed process; so I made another operation, and applied the aromatic sulphuric acid, full strength, in the same manner, to the surface affected. That was three years ago. The tooth is now sound in its socket, and there has been no recurrence of the trouble. She has had the same trouble in other teeth since then; but in the case of that particular tooth there has been no recurrence. This lady was about forty-five years of age, and in rather poor health. I was surprised to hear a remark from one gentleman last evening, warning us not to use aromatic sulphuric acid carelessly, and to hear the gentleman say that he gave it to his patient to use himself. The same thing might be said about almost anything in the dental materia medica. Almost all our medicines are powerful, and to my mind it will not do to trust them in the hands of our patients.

Dr. How: I would like to submit for inspection an instrument designed to aid in the surgical treatment of pyorrhœa, especially in the removal of accretions from the apical portions of the roots; and also a small instrument designed to aid in medicating the apex, so that whatever medicaments shall be used may be carried in very small quantities, by means of this small platinum tube, directly to the affected part. The edges of the instruments are square, and will remove with a pulling or a pushing cut. The sides will scrape the diseased alveolar process.

(Dr. How here exhibited the instruments referred to.)

Dr. HARLAN: If the discussion is ended, I would like to make a few remarks. Last evening one gentleman in discussing this question wished to know how you could discriminate between a salivary deposit and serumal or sanguinary deposits. To my mind there is a vast difference between the physical appearances of those deposits. It will be found on examining the calcareous or salivary deposit, that the pericementum has not been detached beyond the line of deposit. In any event, the serumal deposit on the roots of the teeth or necks of the teeth is not continuous, but broken up into little islands, if you please. It will be impossible to lift the pericementum from the roots of the teeth beyond the line of deposit of the salivary calculus.

Whatever may be the initiation of pyorrhœa,—mechanical, chemical, or traumatic,—whatsoever it may be, it has a beginning at the gingival margin. The integrity of the ligament surrounding the neck of the tooth must first have been destroyed, and this ligament must have been separated. Now, after you have this condition, it is easy to understand how serumal deposits may accumulate. It is believed that in connection with this injury micro-organisms of a peculiar form are found; that these micro-organisms themselves manufacture a soluble ferment, which destroys the tissue in advance. If that theory be correct, it is necessary that a remedy to destroy micro-organisms be injected. The reason for the frequent re-injection of the pockets is that while you may destroy the fully developed organisms, you may not at once destroy the spores, so that it will be found necessary to keep repeating the process every three or four days, until every spore has been destroyed. The theory that a special form of life is present in these pockets at the beginning of these attacks, and that they form a soluble ferment which destroys the tissue in advance, has been put forth by Dr. Black, of Jacksonville. Some other gentleman has spoken of the necessity for friction. I have labored under the impression that the friction of mastication would, under ordinary circumstances, be sufficient. If the teeth are so loose that they cannot be used except by wiring them, they should be wired, and the patient will then have no difficulty in using them. A lady who has been under my care, coming from a distance, stated to me about a month ago, that within a few weeks past she had been able for the first time in three years to masticate solid food. She has gained more than twenty pounds in two months and a half since the commencement of the treatment of her mouth. She told me that she had had more satisfaction in the use of those teeth during that time than for the three previous years. When a gentleman so eminent as my friend Dr. Peirce rises on this floor and states that it is impossible, in his belief, to cure a case of pyorrhœa alveolaris, which he desires to define as coming from a constitutional cause, and further states that the remedial treatment of such cases is confined to one remedy, which remedy, according to his own statement, it would be impossible in every case to get to the diseased spot by the method stated,—with a spatula,—I do not wonder that he believes it impossible.

I have had hundreds of letters from gentlemen all over the United States, and have visited the offices of a number of them who have written me that they were trying the treatment I recommended

and then asked me to see their patients; and when I asked them for the remedy or the remedies, or the instruments to show them how to manipulate, and how to use the remedies, they did not have them! Now, how can gentlemen expect to accomplish anything unless they themselves will faithfully try to be honest. It is no just criticism upon a method of treatment proposed, when the critic himself does not practice or attempt to practice that which is advocated, and which he condemns.

Dr. E. PARMLY BROWN: There seem to be two grounds taken by the gentlemen in this discussion. One is, that pyorrhœa alveolaris cannot be cured; the other, that it can be cured. Who would think of condemning a physician, who has been treating a case of chronic sore throat, because the sore throat re-appeared in a year or two? What dentist would blame another for having once, to all appearances, cured a case of pyorrhœa alveolaris, because the disease had recurred in three or four years? It takes several generations to cure and eradicate this disease. It is in the blood,—"in the family." The child says, "My mother's teeth all dropped out. My sister's teeth commenced to drop out. I have been coming to a dentist since I was a child for this particular disease." Dr. Harlan is right. He has cured some cases. So have you; so have I; but can any of you tell what condition those cases will be in five years from now, or sooner? Many of them will require further treatment. Does a man let his wooden house burn down because it has caught fire two or three times before, while his neighbor's brick house never gets on fire? No, sir. He takes a pail of water and puts the fire out when it starts again, if he can. We must do the same with pyorrhœa alveolaris.

Dr. SHEPARD: From my observation of this disease, I think it is possible to wipe it out in the first generation. Whatever constitutional tendencies there may be, I think it is entirely within the province of the dentist to prevent it, in every individual case, from occurring in the descendants of those who have suffered from it. It is curable to the extent that any disease is curable. It can be so far kept down that its ravages shall not work destruction to the tissue. By taking it in the early stages, there will be no loss of the alveolar process, no inflammation of the tissues, and such a degree of health can be assured that the teeth shall be firm, and continue firm through a long life. In families where the father and mother have both been sufferers and the children have come under my care at the proper age,—when children in educated families do come into

the dentist's hands,—I have found this to be the case. The hope of the future for our patients lies, it seems to me, in our belief in this truth, and in our spreading it among our patients to such an extent that they will bring the children to us for care and treatment early in life. As Dr. Peirce said, it is only tendencies which are hereditary. Those tendencies we need to watch for, and when we combat them at an early age, there is no injury to the patient.

There is one other criticism which it seems to me should be made upon the discussion, so far. That is, that the terms have been very loosely used; so loosely, that it would seem as though some of the gentlemen who have spoken did not understand what they were talking about. I do not think that is probably true; but it is true that terms have been used very loosely. The term pyorrhœa, as is probably known to a majority of those present, is merely a name for one of the symptoms which are visible; the meaning of the word being simply "pus-flowing." This refers to only one manifestation of this disease, either that there is pus flowing from under the edge of the gum, or that it can be forced out by pressure. Of course, using the term as we do, we make it express other symptoms and conditions,—the loss of the soft and hard tissues, the inflammation which is present. It seems to me we should keep as closely as possible to an exact definition and use of terms. There is no name, among the many which have been suggested, which exactly expresses this disease. Many have been seeking for a name which should include more of the symptoms. I have felt for years that it was a legitimate office of this body to introduce terms, and insist on the accurate use of them in these discussions. The Section on Nomenclature already exists, but it has, in my opinion, almost entirely ignored its legitimate meaning and design.

Dr. ATKINSON: Let us get our minds back to what disease is and how it comes, and whether it is capable of being limited or annihilated; whether, indeed, it is or is not self-limiting. There is such a thing as antidoting a diseased activity which is the result of the introduction of a foreign element into a functioning body. One gentleman very wisely said that it had become an aphorism in pathology, as it had in physics, that if you remove the cause, the effect ceases. Every phlegmonous abscess is self-limiting and self-curing, if you do not interfere with it. There are two modes of its limiting and two modes of its cure. One mode of limitation is by spontaneity of the functioning power in a body, where the production of the diseased activity goes in the direction of the least resistance;

hence, if you have the beginning of a pustule, boil, or phlegmonous abscess near a bone, it will go toward the soft tissue, by reason of the greater resistance of the denser tissue, until ripened. If you press upon that, so as to prevent influx of the pabulum that is wept out from the capillaries, you will abort your boil. Nature sometimes does that by the surprising of the nutrient current by the reception of good or bad news. You will say that is going into figment and fancy! but we live by figments and fancy. It is the first impression that sets the deflection up which results in that which is called disease. So the same forces may kill or cure, or they may poison or heal.

Every alveolar abscess would be cured by spontaneity if there were no foreign element there, just the same as a boil in the soft parts, when it bursts, and the core, as they say, comes out, heals spontaneously. Why do not these cases of pyorrhœa alveolaris heal? Why do not what used to be called fever sores heal? Simply because of the introduction of micro-organisms floating in the air, which set up a ferment that is adverse to such healing, so that the tissues cannot be rebuilt at that locality, and you get a succession of discharges. I have cured abscess of twenty-four years' standing, on a superior central incisor, in eight days, by simply removing the fistulous tract, and injecting with a compound of creasote and oil of cloves, equal parts. It is folly to talk about its recurrence. A recurrence of disease in such a case is the recurrence of incompetency on the part of the investigator, or else the recurrence of malevolence, in the having of a bad habit, to persist in a wrong position, knowing it to be wrong. These cases that have been spoken of as a recurrence of the disease, if they were a recurrence in the true sense, were simply outbreaks in a territory that had only been half cured, little tracts having been left in which bacteria could lodge and find oxygen enough to keep them alive, to break the tissue down again. Now, by the recuperative law of nature, there must be a making of its way to the surface, a discharge of this broken-down tissue from the system, or, taking the other course, its encystment. What is encystment? It is the inclosing of a body that has no affinity for the tissues, or even compatibility with the tissues, by a substance so indifferent in its movements of nutrient activity that it makes a pellicle which is nearly a mineral. When that is made a mineral, the next to it will be of a vegetative character, and the next outside of that will be the lowest form of animal functioning. Thus when you get a ball or any other foreign substance encysted

in the tissues, it may remain there for years. I have in my own person a splinter of wood that is now so nearly absorbed that I can hardly find it, except when the tissues are a little lax from a debilitated condition of the body. The point to which I wish to draw your attention is that where you have a body that is inimical to the organization, the organization will make an effort toward self-cure. It is not the medicine that cures. In the physical economy we find a poison or a remedy in the same force. We must get rid of this idea of specificity of activity, and get back to an understanding of the divine radiancy that makes planets and the inhabitants of planets; that it is that divine energy which we call solar influence that does this work. But to this solar influence, this universal force, you must add a plus—that is, the unseen element. This great energy whose first expression is light—this and plus work all things operated on this planet. Each individual human system is a solar system with all its planets. That they say is away in the clouds, and so it is. But each one of the elements of the tissues must have its little share of divine radiancy, to the measure of its demand. When it has that there is a wholesome condition. When it is offered more than its demand, it will not take it. When it gets less, it sets up a howl and asks its neighbors to help. When they contribute of their little, they decay, and here is the point of entrance of the mischief, of the unkindly movement which is entirely beyond the perception of any eye, yet illumined to the understanding mind. When we shall have understood that there is a limitation to the possible life by nutrition of any of the elements of the tissues, we may see that there are times when they come of age, and go out by a sort of senility—that is, a rejuvenescence, by passing into another mode of expression. That is what we want to take hold of in these very conditions, where we need to have something to annihilate the bacteria in all ulcerated-suppurating surfaces.

I told you last night a number of remedies. Another is a saturated solution of salicylic acid in alcohol, which coagulates the coagulable part of the tissues so beautifully as to make a dressing of its own, allowing a building-up, a reproduction of tissues, taking the same steps that were taken in the building-up of the original structures.

The teeth are a very favorable territory in which to study all the laws of organization. For instance, in the enamel we have an analogue of the mineral kingdom. In the dentine we have an analogue of the vegetable kingdom. In the pulp we have the veritable ani-

mal kingdom, operating under the law of radiancy according to the type to build it up. The enamel is built once for all. The dentine is built once for all, in the primary dentine, but the secondary dentine is, under healthy conditions, continued until the pulp itself is obliterated. As in the ruminants, all those creatures that feed upon grass, the grazing animals, which are subject to a wearing away of the incisors, we have the successive steps involving calcification, consolidation, and dentinification, carried on to the very end of life, as we can see in examining the teeth of old cattle. When we understand these laws, as expressed in organisms, high and low, when we are impelled by a desire for the benefit and advancement of others, we will then, indeed, become the divine healers, to be which we all aspire.

The exanthemata and all specific diseases are self-limiting. In a perfectly vigorous organism none of them would take root or hold. So that even in those diseases which we call specific, scarlatina, small-pox, and all the exanthemata, there can only be a taking hold where nutrition is somewhere unsatisfied. It is well known that there are some persons who cannot be inoculated so as to transfer vaccine virus, so as to set up that retrogressive metamorphosis which must exist in such cases, and which leaves the unsightly mark so familiar to us all.

SECTION VII.

PHYSIOLOGY AND ETIOLOGY.

REPORT BY W. C. BARRETT, CHAIRMAN.

[Before making his report, Dr. Barrett passed around several sealed tubes containing pure cultures of several of the forms of micro-organisms found in the mouth, which he stated were prepared by Dr. Miller, of Berlin.]

Physiology.

PHYSIOLOGY may be defined, the study of function. Everything, therefore, that has special reference to the nutrition of the body, to secretion and to excretion, may be properly considered under this head.

Digestion is a function the object of which is the preparation of alimentary substances for assimilation, and the separation and expulsion of the excrementitious portion as fæces; assimilation is the function by which living bodies appropriate and transform into their own substance the products of digestion. Both together constitute the function of nutrition.

That the condition of the organs which it is our special province to care for is very largely dependent upon their nutrition, no thinking man will deny. In many instances a perversion of nutrient currents, a lack of tone in the assimilative or digestive machinery of the system, is primarily manifested in the teeth. A perfect apparatus must perform perfect work. Given, then, an individual with a healthy, normal nutrition, the teeth should, in the absence of malformations that may be denominated accidental and extraneous to the present consideration, be anatomically and histologically perfect. Subsequent lesions are, of course, pathological, either externally or internally, and their consideration is not pertinent to the present inquiry. Given, again, an individual with structurally imperfect

teeth, and it follows, if our reasoning be correct, that the fault is nutritive.

What, then, is the exact source of the lesion? Is it in the digestive or the assimilative functions? Is it pre-natal, and therefore maternal, or is it personal to the diseased organism? Is it general or local? Is it due to improper or imperfect alimentation, or is it strictly and entirely functional? These are questions that may well make us pause in the generalizations with which we are apt to stifle the inquiries that naturally arise within us.

It has been urged that our structurally imperfect dental organs are due to unnatural habits of life; to improper diet; to the vicious preparation of articles of food; to the removal of necessary ingredients from that which nature has provided as pabulum; in fine, to an artificial and abnormal manner of living. In a paper previously published I have considered these points. You will allow me to repeat some of the conclusions to which I there arrived.

If imperfect teeth be due to any of these things, it will only be necessary for us to go back to the natives who were free from all the so-called vices of our modern civilization, to find a different state of affairs. During the past year I have received the testimony of many observers who were stimulated to inquiry by the published accounts of the condition of the teeth of certain pre-historic races. I have received letters from many professional men who have made examinations, more or less critical and exhaustive, of collections of skulls in all parts of the world, and of very many of the earlier races of people, who existed under the most diverse conditions, in all extremes of climate, whose habits of life were the most widely varied, and whose food ranged from the almost exclusively fruit diets of the tropics to the wholly animal alimentation of the frozen regions of the far north. With a single exception, all these observers bear witness to the fact of the existence of nearly all of the dental lesions of the present day; and the general verdict has been that, from the earliest times of which there remain dental traces down to the present, there have been little other than local changes in the condition of the dental organs. Our honored President exhumed about a dozen skulls of the early Egyptians, and the impression upon his mind was that they were comparatively free from the evidences of oral diseases, but, as I understand, he made no records at the time, and his evidence is but the dim recollection of hurried observations made some years since. In any case, the number of skulls examined was not sufficient to indicate anything more than a possibly acci-

dental deviation from the general condition. Dr. J. J. R. Patrick, of Belleville, Ill., has exhumed and examined the skulls of thousands of American aborigines,—races that existed long previous to the advent of the American Indian,—and his evidence is positive upon this point.

These records are fatal to the theory that dental lesions and imperfect structural development are modern, and due to our present artificial habits of living.

It is true that wild animals, in the absence of interfering accidents, have perfect dentitions; but it is also true that in them traumatic lesions heal without suppurating inflammation, indicating more perfect function. (In an examination made this summer of the skeleton of the *Elephas giganteus*—the Mastodon exhumed at Cohoes, and now in the State geological collection at Albany—I discovered an abnormality in the absence of one of the molar teeth; but any one who is acquainted with the process of the eruption and shedding of the teeth of all of the genus *Elephas*, will readily understand that this may easily have been accidental).

It seems demonstrated that general structural imperfections of the teeth of man reach far back, and antedate the historical era. As the teeth of animals remain structurally perfect under all vicissitudes of alimentation,—whether rioting in plenty or barely existing in a state of semi-starvation, whether feeding upon the crude products of nature or living upon food prepared for them in a state of captivity,—and as the teeth of man are in general structurally imperfect under all circumstances of diet and habits of life, it cannot be that mere dietetic influences exercise any very important part in the development of the teeth, and therefore the prescribing of artificial foods, of the phosphates, etc., for the purpose of supplying lacking elements, is founded on a mistaken theory. If they act at all, it must be remedially.

A careful analysis of some of the foods supposed to be lacking in the phosphate elements that enter into the bones and teeth, finds an amount largely in excess of the needs of the system. Even supposing a pregnant woman to live solely upon the finest wheat flour, the amount that she would consume contains a much greater quantity than would suffice for her own wants and those of the fetus that she carries. It is a fact that pregnant women and rachitic children excrete the mineral elements largely, showing that under all circumstances it exists in excess in the food.

Considering all these facts, we must seek in functional disturb-

ances, in impaired digestion and assimilation, the cause for anatomical and histological imperfections in the teeth. But the record of these abnormalities (if they have not already become the normal condition) extends so far back that it demonstrates these functional divergences as inherent to the present condition of the human race. Whether in the long course of development of man in his present state from some lower order, or from some remote intellectual condition, the nervous organization—the brain, the intelligence—has been cultivated at the expense of the mere animal functions, it might be profitable for ethnologists to inquire. That the causes of the lack of perfect development in any part of the human system are in some way connected with non-assimilation, many considerations lead us to believe. That the habit of looking solely to the diet to find reasons for existing abnormalities is a search in the wrong direction, most thinking men will admit. It is time for dentists to take a broader view, and by a more careful study of function, by deeper physiological research, by the abandonment of specific treatment and a careful examination of all the factors that enter into the problem of existence, to endeavor to become physicians indeed, in the very broadest sense of the term.

The Etiology of Dental Caries.

It is indisputable that within the last five years more has been learned of the probable character of dental caries than during the whole previous history of the profession. The late discoveries of Koch, Pasteur, DuBois-Raymond, and others, in the pathology of zymotic diseases, have paved the way for investigations that have revealed the nature of many oral diseases.

Sir William Jenner was far in advance of his age when he discovered that inoculation with the vaccine matter from animals suffering with cow-pox was a protection from that dread scourge, small-pox. He had noticed the relation between the two diseases when but a student, because of the popular belief that the two were antagonistic. At length, after long study, he inoculated a boy about eight years old, on the 14th of May, 1796, with cow-pox matter, and subsequently with variolous matter, and, as he had predicted, small-pox did not ensue. But he was far from comprehending the true principles of this protection, and, until a recent period, vaccination for small-pox was but an empirical method, accidentally discovered. It was left for modern pathologists to demonstrate that all the so-called zymotic diseases, together with many others not

previously suspected as such, were due to certain microscopic organisms that multiplied with astonishing rapidity in the human system; that each one of these maladies had its specific organism, but that they were antagonistic to each other, and that when certain ones had been allowed to run their course they exhausted the ability of the body to nourish certain others. Physicians had always been aware that a patient who had once had small-pox was not liable to a second attack, except under circumstances and conditions that were very unusual. The studies and observations of Koch gave us a clearer insight into the character of those organisms, for he isolated some of them, and learned their life-history. Finally, Pasteur crowned the work with his immortal discoveries, and to-day we know that if a person be guarded against the intrusion of these microbes, the contagious diseases need no longer be feared. We have learned that the final dissolution of all nitrogenous substances is invariably brought about by the influence of micro-organisms, and Tyndall demonstrated that if they be excluded putrefaction and fermentation are effectually prevented.

Few, however, even in view of these discoveries, would have anticipated that any of these organisms might prove to exert an influence in the production of dental diseases. The theories concerning dental caries that had been entertained held that the disease was but a chemical solution of matter that must be considered inorganic. The fact that it was living, vital tissue was not considered, and caries was looked upon as a simple change of affinities, such as occurs in the chemist's retort.

In 1868 Drs. Leber and Rottenstein published their work on "Dental Caries and its causes," and in 1873 it was translated into English by Dr. T. H. Chandler, of Boston. In this they advanced the theory that the disease was mainly due to the influence of certain fungi of the mouth, the chief of which was *Leptothrix buccalis*. Long previously it had been discovered that vegetable organisms existed in the oral cavity, but comparatively little weight had been given to their presence, which was usually supposed to be accidental. Ficinus had averred that dental caries was sometimes due to infusorial animalculæ that produced a putrefaction of tooth-substance; to these he gave the name of *Denticolæ*. Klencke described a soft caries caused by putrefaction, as he called it (at present we know that caries is not produced by putrefactive, but by fermentative, organisms), and another due to a parasite that he called *Protococcus dentalis*. But these observers made little impression.

At the International Medical Congress, held in London in 1881, Drs. Underwood and Milles produced a joint paper, in which they attributed caries of the teeth to the direct action of micro-organisms which, penetrating the dentinal tubuli, destroyed the living substance of the tooth, leaving the inorganic matter to be broken down and washed away in the fluids of the mouth. This theory was accepted by many persons in this country, and is still vehemently urged by them.

In the laboratory of Carl Heitzmann, of New York, observations were conducted by him, and by Drs. Frank Abbott and C. F. W. Bödecker, and their conclusions were published to the world. Their theories necessarily rested upon the reticulated structure of protoplasm, as taught by Prof. Heitzmann. They held that caries was essentially due to an inflammatory condition of this reticulated vital matter, and that the course of the disease did not very materially differ from that of inflammation in other tissues.

In 1881, at Wiesbaden, in Germany, at a meeting of the American Dental Society of Europe, some of those present listened to a paper by a young dentist previously unknown to fame, except as the thoroughly educated son-in-law and coadjutor of the well-known Dr. F. P. Abbot, of Berlin. This was the first of a long series of papers since published by Dr. W. D. Miller, and it was the initial point of a course of experiments and observations such as were new to the history of dentistry. The results are before the profession, and they have placed their author in the very front rank of experimental observers. He proceeded scientifically and systematically to make an exhaustive study of his subject by cutting thousands of slides of diseased teeth. In these he found micro-organisms invariably present, so that he was enabled to deduce the rule that they were in some way essentially connected with caries of the teeth. Thus far Milles and Underwood had proceeded, and to this point his observations were corroborative of theirs. But he proceeded further, and endeavored to determine in just what way they were instrumental. He made pure cultures of these organisms and studied their life-history. He segregated a number of them, and was thus enabled to study them morphologically, physiologically, and chemically. He pursued these investigations perseveringly and unweariedly. On his late visit to this country he brought with him some of his pure cultures, and I have the pleasure of exhibiting a few of them to you now. It should be remembered that within these little tubes is contained the record of the most exhausting work, continued un-

remittingly for three years. So great was the difficulty that attended their production that it was a full year before he was able to segregate a single one of these organisms successfully.

He has demonstrated that caries of enamel is produced almost, if not entirely, by acids generated in the mouth; that caries of the dentine is largely, if not wholly, due to the action of micro-organisms, or ferments, that secrete or produce within the dentinal tubuli an acid that has the power to decalcify tooth-structure, and thus caries penetrates deeper and yet deeper within the body of the tooth, the decalcifying process preceding the actual presence of the organisms. By inoculating a culture fluid, or medium, with a certain definite organism, in an acid or neutral solution, he has succeeded in producing artificial caries that it is impossible to distinguish from that which occurs in the mouth. It is, possibly, unfortunate for him that he has not been fully comprehended by those who did not perceive the difference between putrefactive and fermentative organisms. It is only the latter that are active in the work of caries.

Perhaps I cannot better summarize the results that he has obtained than in his own words, at the close of his series of articles in the *Independent Practitioner*, July, 1884:

1. I convinced myself by the examination of some thousands of slides of carious dentine that micro-organisms were always present, and that they, without any doubt, were the cause of various anatomical changes which were found to take place in the structure of the dentine during caries. Of course, the question of priority does not suggest itself; Leber and Rottenstein, as is well known, were the first to give definite expression to this fact.

2. I proved, at the same time, that the invasion of the micro-organisms was not, in the majority of cases, simultaneous with the softening of the dentine, but that large areas of softened dentine could be found that contained no fungi. Of all those who examined my preparations in America, no one, whatever his theory, ever once denied this fact. I concluded from this that the softening of the dentine went in advance of the invasion of the organisms.

3. I determined, by analyses of masses of carious dentine sufficiently large to give reliable results, that the softening of the dentine is of the nature of a true decalcification; that the decalcification of the outer layers is almost complete, and diminishes in degree as we advance towards the normal dentine; furthermore, that the same relations maintain in dentine softened in a mixture of saliva and bread, or in weak organic acids; also, that in a mass of carious dentine the lime-salts had been removed to a much greater extent than the organic matter.

4. I maintained from the first that the softening of the dentine was produced by acids, for the most part generated in the mouth by fermentation. I had, however, no direct proof of this.

5. I *proved* that fungi exist in great numbers in the human saliva and in carious dentine, which have the power to produce acid under conditions which are constantly present in the human mouth. I determined this acid, for one of the fungi, at least, to be the ordinary ferment, lactic acid.

6. I produced caries artificially, which under the microscope cannot be distinguished from natural caries, by subjecting sound dentine to the action of these fungi in fermentable solutions.

7. I determined the influence of various antiseptics and filling-materials upon the fungi of caries.

8. I isolated various forms of these fungi, and determined *in part* the conditions most favorable to their development, their characteristic reaction upon gelatine, their physiological action, their effect when inoculated into the system of lower animals, and their possible connection with certain obscure diseases generally attributed to the carelessness of the dentist.

At the late meeting of the American Medical Association, held in Washington, May, 1884, before the Section of Dental and Oral Surgery, Dr. G. V. Black, of Jacksonville, Ill., a man whom we all honor, read a paper that presents some novel views of caries of the teeth. I have not seen the paper in full, and am not therefore prepared to give an intelligent *résumé* of his theories and deductions, but I am assured that he will shortly present to the world a work upon dental pathology, and for that every thinking man of the profession will look with interest and eagerness.

In conclusion, I desire to say that, while wonderful progress has been made during the past year, the task is far from being completed. Dr. Miller himself says that there are yet, in his opinion, many factors that have not been intelligently or exhaustively considered. He himself will shortly commence a new series of observations and experiments, for which his previous labors admirably fit him, and from which his profession and the world of science have much to hope. Other students, in various parts of the world, are engaged in careful study, and we may well believe that we have entered upon an era that will end in the acquisition of knowledge that will enable us more successfully to cope with the difficulties of dental practice.

DISCUSSIONS.

Dr. SPALDING: I would like to inquire whether Dr. Miller has made any pure cultures from the dental caries artificially produced?

Dr. BARRETT: That would be a work of supererogation. He produces dental caries from a single segregated pure culture, showing that there is one organism that produces caries.

Prof. MAYR: It seems to me that the apparent difference between the views of Dr. Miller and those of some of the first defenders of the septic theory in this country has been much exaggerated, thereby causing many to consider the whole subject as more doubtful than it is. This difference depends entirely upon what we call decay. You look into the mouth of the patient who complains of a decayed tooth. There is the smell of decay, there is pain. Now, the smell is not the decay, and the pain is not the decay. You take an instrument and dig around a little. After you have removed the outer mass of decayed matter, I do not think you have yet touched the point of disease. You must go down deeper. After you have excavated deeper, the patient begins to twitch. Now, I presume you have reached the point where you can begin properly to say that you have touched the decay. You excavate further, and the patient becomes happy again. It seems to me that in doing that you have gone through the decay; the decay was something between the mass which was first encountered and the healthy tissue of the tooth. I think all our dispute is because we fail to realize this precise point. The outer mass found in the cavity is not decay; we agree on that. And, when we get through to the healthy tooth again, we recognize that this is not decay; but there seems to be a dispute as to the intermediate point. What is this intermediate point? Is it merely decalcified dentine that we meet with in that particular spot?

Dr. ATKINSON: Do you mean decalcified or dissolved?

Prof. MAYR: I say decalcified, because almost everybody speaks in this way. Is this really decalcified dentine? is it simply a different form of the tooth, or is it an entirely new production? The real line of disease is probably not a thousandth of an inch thick: the real diseased layer can certainly be fixed within a microscopically small territory: and we will never agree if we do not establish exactly our fighting ground. It seems to me that this is the only point of difference. Dr. Miller seems to me to be talking and experimenting altogether too much about the outer mass found in the cavity. This is of no particular interest; it is the corpse of a tooth. The point of interest is the thin layer where the physiological changes are going on.

We in this country have been experimenting and working, too, upon this subject, as well as Dr. Miller, although perhaps not with the same facilities. Dr. Miller has the one hundred professors, the fine microscopes, etc., of the University at Berlin at his disposal,

but I think some of the honor for what has been accomplished should remain in this country. I think it would be unfair to those who have labored in this country to so completely overshadow and silence them as it seems to me has been attempted. I do not say this for any personal reason, for I have no possible personal interest in it. A number of experiments have been made by investigators in this country, and, as I said before, the only point of difference between them and Dr. Miller seems to be in what each conceives decay to be. About three years ago, also, I made careful analyses of this diseased layer between the corpse or outer mass of débris and the healthy dentine. I was very careful in my work, and, though I had taken a mass of decaying matter which was only one seventeenth of a grain in weight, I was sure of my results; and in this thin layer there was no diminution of the lime-salts. There was no doubt about it. Therefore, whatever may be true of the outer mass, as to that particular layer about which we are fighting, I have a conviction, and an honest conviction, based upon my personal investigations, that, at the real point of decay, there is no appreciable loss of the lime-salts. The process of decay at this point is a physiological process,—some may say a pathological process; but that depends only on the view you take, for physiology and pathology comprise the same processes, only the first are in our favor and the latter against us: hence a subjective difference of no value. This process is, to my conception, a physiological one, and, therefore, to say that we have settled it by saying decay is due to fermentation from without seems to me to be very reckless. I would rather say that this precise phenomenon which we call the process of decay is still in the realm of physiological processes, and is not yet definitely settled.

Dr. ATKINSON: I rejoice with exceeding great joy that we have at last come to a point, and that point is the initiation of the action that is nominated decay. Where does that occur? We have just heard from my learned and beloved friend. He said one word that, were it written in deep lineaments upon all our consciousness, would be a talisman to deliver us from all evil of investigation. That is, to have one definition, one term expressive of one process, and then we would not be so tangled up, and have to deal so ambiguously with questions that clearly come before the mind, but that cannot be brought to be revealed to the senses. The products of a process, as the last speaker has learnedly and clearly shown, are not the process itself. The tracks of the game would make a poor dinner.

You may show the track of the buffalo to the hunter, and it may be never so fresh and capable of being followed by the instinct of the dog or the sharp eye of the animal that is after the buffalo, but the tracks themselves would make a poor dinner. Just such dinners have we been invited to by those who claim that the germ theory —and they use the word theory in the sense of speculation only— by those who claim that the germ theory is demonstrated to the exclusion of physiological processes. I commend the last speaker with my heartiest congratulations, and I wish to express to the author of the paper which has been read my deepest affection and mental recognition of the clear delineation of his comprehension of the subject before us, as presented by him. What is a process? It is a going on of something to something. What is a thing? It is a mental concept formulated. It is a think formulated and defined; a distinctly perceived thought. I thank you for saying that pathology is only perverted physiology. The function of building a tooth is the evolution of all its parts. The function of decay of the tooth is a perversion of the currents of energy. Therefore, decay is the reversing of a current. What is that current which we nominate a nutrient current but an evolutionary current—a building-up of the elements that constitute the tissues that we are dealing with? And we are now dealing specifically with enamel and dentine. The action of these currents is in obedience to what I have been much abused for calling a typal order. The typal order of the enamel is a modified typal order of the dentine. The influence of the lime-salts is similar, and we see a harmony in the protoplasmic lines, showing that it is really a living tissue that has to be nourished to be kept in proper condition. It is that nourishment that we are talking about. I have just said that decay was a perversity of a nutrient current, of a nutrient activity. What are lines of nutrient activity? They are courses through which the blessed light of heaven, plus energy, go to organize teeth and other parts of this wonderful system of ours, which we dissect so as to get at their anatomy.

My friend persisted in saying "decalcification," when I asked him about it. He did not mean that at all. God bless you, my friend, for saying there was no appreciable difference in the amount of lime-salts of the tissue taken from the dominion of decay, that it was exactly like healthy tissue in that the equivalents were there in their exactness.

What is it which takes place when a fellow comes into your house

to court your wife and take you away from her, or her from you? He has no effect at all until he can pervert her currents of affection; and then good-bye to peace in that house. That is exactly what goes on in the components of the tooth. You don't see the point, but I will tell you in a minute. When the combination between the husband and the wife is taken away, then you can get a divorce much more easily. What is the corresponding combination here in the tooth that we are talking about? The stiffness is caused by the hardness of the lime-salts in the relation that we call the basis-substance of the dentine. Are there any bacteria there? Who of us have seen any bacteria there? Observers have never seen any in the intermediate basal substance, which is nothing but lime caught in the meshes of the glue; that is the enamel basis. We find the attacks on the structure of the tooth taking place in this basal substance; softening of the tubules going up the fibrillæ. And yet you find no bacteria there.

I do not pretend to say what the process is that is now being revealed to us, or near the revelation of which we are, as to the proliferation of these so-called micro-organisms; but I have this to say, from the depths of my affection, from the best action of brain and my profoundest conciousness, that they are not seen by us by the highest power of amplification and concentration of light that we have yet had. The ghost of the bacterium is the first thing, before the bacterium can take conformation; or else you could not differentiate that. When we can catch the ghosts and get the form and specificity of the ghosts, we can reach the beginnings; but when we can only take those after they have been ripened by reason of the presence of the ghostly inhabitants we shall be dealing only with the tracks of the game, and we shall not have a very satisfactory dinner. That is the kind of a feast we have been having for years. Let us hold fast to the truth as we have it, and strive for more light and more proof. We want, in our own mental ratiocination, to get at the demonstration of truth and reveal it to all the world. When we have an object under the microscope, let us carefully note all that it reveals, whether it sustains our preconceived view or not. Let us not be led astray by any argument that because some one else has not seen something, therefore it cannot be seen. As has been said with regard to these nutrient currents, they are so fine and so spirituelle that the natural mind, the ordinary perception, cannot see them, until it is converted. Now, in our mental processes we have just to return to the embryonic condition; we

have to assume that we are novitiates before we can progress. I would rather take five boys, fifteen years of age, who had simply an English education, and agree to make them good anatomists, physiologists and pathologists, therapeutists and operators, in the succeeding five years, than to take five graduates and agree to make them first class men in the same time. Do you know why? Simply because there would not be so much error to combat.

Let us encourage the men who are making these investigations, until they shall bring all out so clearly that he who runs may read.

Dr. SPALDING: I have long held the opinion that there is no pathological science except as it is preceded by physiological science; that there is no pathology, *per se*. There are no such things as pathological functions. There are no such things as pathological growths, *per se*. The processes are all physiological processes inverted or perverted, and the growths are physiological growths out of place. I know that we do not much understand, first, the science of physiology, and second, the science of pathology; hence I arise at this time to set forth these particular views, that we may get a clearer apprehension of what we are studying. The study of physiology should precede that of pathology, for how can we comprehend the condition of disease unless we first know that which constitutes health? In the unfolding of medical science physiological knowledge has ever opened the way to a knowledge of pathology; hence, a cellular physiology rendered the theory of a cellular pathology possible. Our text-books are full of descriptions of pathological anatomy, of pathological growths, and of pathological processes, when, as Dr. Atkinson has well remarked, there are really no such things; but they are simply inversions of true physiological forces, which produce results which are called pathological. I only wished a little more forcibly to bring out the idea which was alluded to by Dr. Atkinson.

Dr. BARRETT: We came here not to study ghosts, but material things. The question that is presented for our consideration is not that of the tracks of the game at all, but the game itself; and we wish to get down to the actuality of it. Concerning the pathology and etiology of dental caries, until within a comparatively short time, we have not arrived at anything definite. It has been demonstrated, within a few years, that micro-organisms play a much more important part in the universe than had been suspected. No one would have dreamed that they could be considered as important factors in dental caries, until within a very short period of

time. Leber and Rottenstein demonstrated the existence of a fungus in the mouth; but we are not speaking of animal bacteria. The fungi of dental caries are of a vegetable nature. They do not exist at the same time as, nor in conjunction with, putrefaction. Milles and Underwood made certain observations in which they undertook to follow the lead of Dr. Miller, and re-performed the experiments upon which he had based certain conclusions. They made this statement, —that they prepared cultures, and kept them under the conditions which he stated until they became so offensive as to preclude the possibility of further observation. They had *putrefactive* organisms present, and consequently could not produce artificial caries. There was something lacking. They did not obtain the same conditions that Dr. Miller produced, and which he had stated were absolutely essential to the production of artificial caries. I would not detract from the credit that is due Milles and Underwood or any other gentlemen. The American school of observers have dived as deeply into that matter as anyone else.

Dr. Miller has not identified himself with the German school, nor with any other, except the American school; consequently, when we look upon him as a foreigner, or as pursuing German methods, or when gentlemen say that he is following the instructions of the German schools, they could not be further off in their speculations.

The chief point upon which all this discussion rests, so far as Dr. Miller goes, is the fact, as I stated, that caries is produced or accompanied by fermentative organisms. Dr. Miller has performed a great many of these experiments.

Prof. Mayr is a man whom we all honor, and we all appreciate the work that he has done. But where Prof. Mayr has made one analysis of decalcified dentine, Dr. Miller has made fifty. Prof. Mayr has made his analyses with the utmost care. Dr. Miller has done the same. Prof. Mayr has done it in the solitude of his laboratory. Dr. Miller has worked with the co-operation of, and his work has been submitted to, men like Koch, DuBois-Raymond, and others, the first histologists of the world. And some of the results obtained by these gentlemen are directly antagonistic to those obtained by Prof. Mayr, and must be proved or disproved by the corroborating circumstances, or by other observations. It is not for you or for me, who have made none of these observations, to pronounce between the two. It is only for us to say which seems the more reasonable.

[At this point Dr. Atkinson rose and addressed the Chair, for the

purpose of obtaining the floor. Dr. Barrett refused to yield, and continued :]

I desire to present my own stand-point on this matter, and to state my belief in regard to it. Roughly stated, the process is something like this: The organisms in dental caries are fermentative organisms. We have present in the mouth at all times conditions favorable to their growth. We have moisture and sugar. If we have not sugar, we have starch, which is easily transformed into it. The first process, according to Dr. Miller's theory, will be the decalcification of the superficial portion of the enamel. In decay of the enamel itself it is pretty clearly demonstrated that micro-organisms cannot play any important part. But after the decalcification of the enamel comes decalcification of the dentine. The lime-salts are removed, so that it becomes a spongy mass, which takes up the saccharine fluids of the mouth that are favorable to the development of fermentative fungi, which there go through their life's history. In the course of their existence they produce or excrete an acid, of which Dr. Miller has made a careful analysis, and finds it to be lactic acid. The lactic acid which is there formed continues the work of decalcification in advance, leaving the vital, organic portion of the teeth for the further development of the organisms. They in turn excrete or secrete a further production of acid, which continues the process of decalcification, and so the process is extended indefinitely; and this is progressive caries. Dr. Miller's views are founded not upon theorizations, and were derived not from his books, but they were developed through his microscope in his laboratory, and are based upon actual observations, thousands upon thousands of which have been made.

Dr. ABBOTT: Dr. Barrett has said that we are dealing with actualities and not with ghosts. I think I understand what is meant by ghosts in this connection: something which we have not been able as yet to discern, either with the naked eye or with the strongest powers of the microscope. Does this put us in the position to conclude that there is nothing beyond what we can now discern? Is there nothing yet left to be found out, or to be discovered? Is it possible that we are not going to have powers of the microscope that will reveal to us things of which we have to-day no conception at all? How was it forty, thirty, or even twenty years ago? Have we not been every year discovering ghosts? Are we not at this very moment at work investigating and endeavoring to unearth the very ghosts that he is talking about? My friend, large as he may ap-

pear before you now, was once nothing but a ghost, and a very little one, too; so that it required a pretty strong power of the microscope to discover him; or would have done so if anyone had been looking for him. We can carry the idea on indefinitely,—so far that it seems almost beyond the conception of man,—*the minutiæ of things yet to be discovered.* It is only a few years ago that a microscope which would multiply five hundred times was something wonderful. This instrument has brought to view things the existence of which had not been dreamed of,—minute organisms which are becoming daily more and more important in the world of science. I have no doubt that floating in the air here to-day are millions and millions of ghosts which would become organisms if they were placed in the proper condition to become developed.

Speaking of caries, it is probably known to the most of you that the tooth consists of quite a little measure of organic material. Nearly one third of the structure of the dentine of a tooth, either in weight or in bulk, whichever it may be, consists of organic matter. At all events there is enough organic matter to form a framework into which the lime-salts are deposited, which results in the formation of what is known as the dentine. Apparently, the results of Dr. Miller's investigations show that certain organisms are found in the mouth. We never denied that. He claims that there is a certain acid in connection with caries. We admit that there is. But when he claims that fermentative organisms are producing the acid which brings about a dissolution of a certain amount of the lime-salts, another question is raised. Dr. Barrett says nothing about one important matter; he would have us understand that these or-organisms leave behind the organic portion of the tooth after they have made a certain amount of progress. He says they excrete a certain acid, which he has determined to be lactic acid. That goes on and dissolves the lime-salts; but he mentions nothing in reference to any life in the organ. Is it possible for anyone of you to arrive at the conclusion that there is no life in the tooth? Is it possible for you to arrive at the conclusion that there is not life in the organism anywhere? You might as well deny it in the one case as in the other. Now, if there is living matter, if there is matter that is subject to irritation,—and I believe every one of you can testify to that,—then it must be subject to an inflammatory process, which is certainly taking place in the tooth after caries has once begun. How can it possibly be otherwise? So the process in the deeper portion of a carious tooth must be an inflammatory one, just as much as absorp-

tion of the roots of the temporary teeth is an inflammatory process; just as much as absorption of bone is an inflammatory process. It does not seem to me possible to account for certain conditions in any other way.

My own idea is that exactly the same process takes place in caries that occurs in the absorption of the roots of the temporary teeth,—that is, in the deeper portion,—the difference being simply in the irritant. You have a living portion of the tooth that has become irritated. The lime-salts are broken down through this irritation. I think Prof. Mayr's experiments have shown that acid is not found in the deeper portion of a carious tooth. Dr. Miller's own preparations that have been exhibited in this country do not show organisms penetrating to the depth of the disturbed or partially broken-down tissue of the carious tooth. I cannot conceive that it is possible to have a destruction of the tooth, in the deeper-seated portions of the disease, in any other way than by an inflammatory condition, which must follow always when living tissue is subjected to irritation.

Dr. ATKINSON: These different men say enamel is decayed by the presence of an acid generated in the mouth. Am I right? Is not that the sum of what they have said? I know it is, whether you know it or not. If you don't know it, it is so much the worse for you. We can destroy teeth by introducing acid from outside of the mouth; but it has not yet been proved that there is a specific acid generated in the mouth by a specific antecedent organism. That is guess-work thus far. I don't say it is not true; but I wish to justify the position that I take as an earnest seeker after truth. If that is so, then there must be a process of generation of these acid-makers in the mouth and continuing to a greater depth than to the first degree of satisfaction of the bonds of the affinities between the acid and the organized substance of the tooth. It is conceded that these acids do not attack the enamel fibres.

Now, there is a great deal more nonsense about the difference between putrefaction and fermentation than appears on the face of it. There are points of mergence, and there are points of divergence; but it has not been proved that a decomposition can take place without having what is called an acid or an alkali preceding it: and if you know enough of chemistry to understand that there is only a distinction of equivalency, of one or two bonds of affinity between an acid and an alkali,—that the elements may be the same, only combined differently, when we call one an acid and the other an alkali,—you will see

what nonsense it is to talk of acids and alkalies as if they were eternal opposites.

Dr. PEIRCE: I listened with a great deal of interest to the report from Section VII., and all the time felt sorry that Dr. Miller was not here that he might be his own representative. I have read all his writings that have been published in this country, as well as those of other friends on this side of the water; and I have watched, month after month, to see what change was taking place in the minds of these men; and I felt, in listening to the report of the chairman of the Section, that he did not fully understand the position that to-day is occupied by Dr. Miller. If you will pardon me, I will read an extract or two to show you Dr. Miller's views at the present time. You will see that he stands precisely where Prof. Mayr stands, and where Dr. Atkinson and other experimenters in this country stand. In his last publication, after recounting his various experiments, he says:

"Although I have now, as I think will be granted, established upon a sure basis the fact that caries of the teeth may result directly from the action of acid-producing fungi in the presence of fermentable carbo-hydrates, the conclusion would hardly be justifiable that, by keeping the mouth constantly and perfectly free from all fermentable substances, or by repeated application of antacids or antiseptics to all parts of the teeth, or by all these means together, we could banish dental caries from the oral cavity."

"A most powerful influence, which we do not understand, is exerted by the nutritive processes in the teeth themselves."

In another paragraph he says:

"I am assured by men who have grown old in the practice of dentistry that mouths which have long been under their observation, and which practically have been completely free from caries for years, at once, on account of some sudden change of health, show a general breaking-down or crumbling of the teeth *en masse*, in the space of a few weeks. We have here a cause which lies without the domain of both bacteria and acids."

Those are two paragraphs which I would like to have go into our Transactions, to show the conclusions Dr. Miller has reached to-day. I admit that these views are different from some that he has expressed, but he has grown by virtue of his experiments. He is not in advance of our American experimenters, but he has come up to them.

Now, this subject is one in which I have long been interested; and I think we may draw some conclusions, or rather strengthen

our conclusions, from some facts outside of the mouth. Those of you who have been interested in what is known as the "potato rot," and other diseases affecting vegetable products, know that where potato rot has been general, it has been during a season when there was some defect in the development or growth of the potato. Some years ago, when I was a boy, I remember thousands and thousands of bushels of potatoes were placed in the cellars, which in a few weeks had to be thrown away. During the season of growth there was a long drought, and then a warm rain, and the potatoes, after having been checked in their growth, grew again rapidly, so that we had in the potato, as placed in the cellar, a want of continuity in its development, and necessarily in its structure. The germs which it is claimed produce this potato rot are no doubt present every year; but there was a condition that offered a ready pabulum and habitat for their development: hence the result. That is one point.

Next, take the "rust" of wheat. Any year, if any of you will go into the granaries, you will find on the wheat grains a microscopic speck. It is there every year. Now, the wheat grows; and just as the head is perfecting, there comes a succession of damp, cloudy mornings and heavy fogs for a week or two. Every farmer says, "My wheat will rust this year." Why does it rust? Not because the germ is there this year more than any other year, but because the condition of the atmosphere accompanying the growth is favorable to the development of the germ. It first develops inside of the straw, then works its way to the surface, and the whole straw is affected, and the nourishment of the head is cut off. So we have a short wheat crop, by virtue of the rust and smut that are the result of this germ that is present under conditions which favor its development.

I might also prove that the germs which affect our peas and various vegetables in the garden develop on the same principle. For, while the germs are omnipresent, their development is the result of favorable but accidental conditions. I mention this, because I think it gives some illustration of the conditions that we find in the mouth.

We have been for some years talking about the low forms of life producing caries, and have come to the conclusion that they do produce it, because we have found, in the broken-down tissue which fills up the cavity after the tooth is decayed, these living germs. We can all recall to mind many cases where the teeth have rapidly decayed, and then, without the aid of the dentist, decay has ceased.

Yet in the same cavities, all the time, have been the leptothrix and bacteria, and all the forms of life that we find in the cavity when decay is going on; showing that, notwithstanding their presence, the progress of decay is stayed.

Dr. BARRETT: Dr. Peirce does not regret more than I do the fact that Dr. Miller could not be present and personally report what he has done. I may have an erroneous conception of what he has done, and the conclusions he has reached. Certainly it is widely different from that of Dr. Peirce, who seems to understand Dr. Miller as asserting, or his observations as proving, that micro-organisms are simply *incidental* to dental caries. Now, Dr. Miller asserts directly the contrary. It seems to me that anyone who reads him intelligently can get no other conception than that he asserts that they do have an active influence in the production of dental caries; not that they are simply scavengers feeding upon diseased territory. He states distinctly and clearly that there are many factors in the production of dental caries. Some of them he knows, and some of them are unknown. There are other heights to climb before we peer from the summit and view the end. But that micro-organisms are simply incidental to dental caries,—a theory which has been urged by certain observers,—is entirely foreign to the conclusions reached by Dr. Miller. None of the observations which he has made have proved that; nor would he, for a moment, I think, assent to such interpretation of what he has written and said.

Dr. ATKINSON: Let us try and discriminate just how far we have gone into this matter, and see how thoroughly we apprehend the laws that we are dealing with in striving to get at the etiology of dental caries. If all the organisms that are found in the presence of dental caries are also found in the absence of dental caries, then we must assume that there is some sort of energy that has to be present to awaken the activity by which the caries is produced; and, ergo, they are not the initiative of the actualities. Is that a clear, logical proposition, or not?

Dr. PEIRCE: That is so.

Dr. ATKINSON: Then I am justified in saying that the thing which I called a ghost, the unseen current of nutrient activity, is the first stage of movement that initiates the unbuilding of the tissues by process of decay. What is the use of arguing that twice two are four?

Dr. PEIRCE: From some of the remarks made by Dr. Barrett I am afraid he thinks I used my own language. I simply read a quo-

tation from Dr. Miller's book, showing what conclusions he has drawn.

Dr. SEARLE: I have had occasion to look at Dr. Miller's paper somewhat critically, and I think I understand his position. He says, whether in the paper cited by Peirce or not I am not certain, that the lime-salts and the basis-substance are chemically united to form dentine. He says they are chemically united by vital forces, and that the same vital force which originally unites them, is able, under circumstances of ill-health, to disunite them.

Dr. PEIRCE: He uses the phrase, "breaking-up the continuity;" says that the continuity is disturbed.

Dr. SEARLE: The point is that he claims that the negative power exerted during certain conditions of ill-health is able to dissolve that which the vital force has put together. This is all the recognition he makes, so far as I recollect, of any vital action in the dissolution of the lime-salts.

Unless he has written a paper later than any I have seen, he does not recognize any vital action of the living matter in producing the decalcification of the dentine, or, as he calls it, the breaking-up of the bond of union between the basis-substance and the lime-salts, nor has he recognized any vital action of the micro-organisms in directly attacking the living tissue of the dentine or particles of bioplasm. This is the point of disagreement between him and Underwood and Milles.

Dr. CLARK: I do not like to say anything reflecting on the investigations of Dr. Miller, for he has done some good work, and is entitled to our thanks. But when other earnest investigators in this country, whose efforts have been just as honest and their results more accurate and beneficial, are entirely ignored,—and there has *been all along* and *still is a studied effort* to keep such names in the background, so that the lustre of one name—that of Dr. Miller—may be more apparent,—when one feels and *knows* this is being done, it is hard to keep quiet. I hate to blow my own trumpet as much as any man, but not being blessed as Dr. Miller in this respect, I am forced to the disagreeable necessity.

The first known, in this country, of bacteria in connection with caries of the teeth was from a paper read by myself, at Charleston, S. C., about twenty years ago. Some twelve years after this I read another paper at the Springfield meeting, and some time after this another before the Odontological Society of New York, and one or two before the New York Microscopical Society. In some of these

papers I did not say much, because the subject was new and little was known, but considerable underbrush was cleared away, and a new road opened up which has been ably followed and improved by the investigations of Dr. Stockwell, Prof. Mayr, and many others, who have had no occasion as yet to *change their course or correct their views*. Therefore, I wish to remind Dr. Barrett that Dr. Miller is not the *alpha* and *omega* of the germ theory of caries, at least not in this country. He has come into the road after it was cleared of many obstructions, has done good work, deserves praise, and I am as ready and willing as any man here to give it; but when, as said before, this is sought to be gained unfairly and by the sacrifice of other co-workers, then I say it is hard to keep quiet. I must urge a veto.

Again, in many respects, Dr. Miller's claims, as represented by Dr. Barrett, will not bear crucial investigation. Here, at my place in Saratoga, as many of you know, about four months of the year is taken up with microscopical research. I have tried hard to see things as Dr. Miller sees them, and to make my experiments agree with his, but in many respects find it impossible.

When I see these little bottles brought here, and am informed that the liquids were sterilized, and hear sterilization referred to as an easy, simple thing, I am forced to the conclusion that either Dr. Barrett or Dr. Miller does not appreciate the difficulties and uncertainties of the operation. It is easy to sterilize a liquid, but hermetically sealing it free of air-germs and retaining it in this condition is quite a different thing. This has been abundantly proved by the experiments of Huxley, Tyndall, and every microscopical investigator of any note. Say the water in this glass in my hand is sterilized; how are you going to bottle it free of germs, when the air is fifty per cent. organic? One germ on the glass, water, or cotton-wool is enough to increase to myriads in no time. Therefore, it is no easy task to close in a vessel any liquid without contamination. In the last few numbers of the *New England Journal* I showed pretty conclusively wherein Dr. Miller's sterilization was faulty. Therefore, in such intricate researches, it is safer to receive the investigations of anyone with considerable allowance, and, unless they bear the tests of others equally competent, they should be thrown aside.

The mooted question between Dr. Miller and myself is this: He contends that caries is produced by acids manufactured in the tubes of the dentine by bacteria, and that these organisms have the power to force the acid thus produced ahead, so as to act on the lime-salts, thus

enabling the organisms to follow. I claim that bacteria are brought into existence within the oral cavity by fermentation through air-germs, and that they enter the tubules or mesh-work of the dentine, absorb the bioplasm or life-substance in the tubules, leaving the lifeless lime-salts in a powdered or disintegrated state, which we call decay. It is impossible to account for their presence and propagation in the mesh-work of the dentine in any other way. It is true that through fermentation these organisms produce an acid, but to believe that they *eat* or *absorb the acid* thus produced, and then *inject it ahead to break down the lime-walls, requires more faith than reason.* We must explain the presence of these organisms in the tubules, what they are doing there, and how they subsist and propagate. This cannot be done on the Miller theory; but all becomes reasonable when viewed in the light which the germ men have earnestly represented.

As to pyorrhœa alveolaris, two or three gentlemen here struck the keynote as to cause and treatment. The disease, like that of caries, being of germ origin, of course antiseptic treatment is the only rational one. When we consider, according to the germ theory, that there is a continual fight between normal life-cells and disease organisms, it is easy to see how a little aid to either side will win the fight.

Dr. DABOLL: One of the charms of the paper that we listened to last night, in connection with the demonstrations on the screen, was the successive steps that the speaker took to prove that the previous steps taken were correct, making the proof as he went along. That is a characteristic of Dr. Miller's methods: he proves his previous work, stopping at almost every step to show that the previous one was not an error. Dr. Miller not only has satisfied himself that caries is the result of fermentative fungi, but he has produced caries in teeth out of the mouth. I have seen the teeth in question. He takes a certain pure culture of fungi, places it on a tooth out of the mouth, without supplying the food necessary to produce fermentation, and no decay results. He takes another culture of the same organism, feeds it in the way necessary to cause fermentation, and produces caries. Now, if that is not proof enough that Dr. Miller is correct in his observations, I do not know what more we can demand. He does not claim that bacteria are not present, or that micro-organisms are not present, but he claims that it is the pure culture of the fungi that produces caries: that in the débris of decay we will find micro-organisms, which are the results more of putrefaction, but that the territory of active decay is occupied almost entirely by the pure

fungi. I asked him pointedly in regard to that, to get an idea of what he meant. I am not aware that any other investigator has produced caries out of the mouth.

Dr. FRIEDRICHS: Magitot.

Dr. DABOLL: I am not aware that he has done it. Of course, a man can immerse teeth in a fluid which will produce a breaking-down of the teeth generally; but to produce a regular cavity is a different thing.

Dr. CLARK: Did you see that production?

Dr. DABOLL: Yes, sir.

Dr. CLARK: Where did the tooth come from, and how long had it been out of the mouth?

Dr. DABOLL: It had been out of the mouth for a long time. It took him quite a while to produce a large cavity in a molar. He also exposed another tooth to the action of the fungi, without feeding them sugar, and produced no effect whatever. The moment that the sugar was given to the fungi, caries commenced immediately, and the breaking-down of the tissues proceeded. I think one of the difficulties that has been experienced by other observers is that they have not distinguished between putrefaction and fermentation. Putrefaction is one thing; fermentation is another. Miller shows conclusively that it is fermentation which produces breaking-down of the tooth-tissue, and to that end takes the pure culture of the fungi, and by feeding sugar produces decay.

Dr. CLARK: If Dr. Miller was questioned as to the so-called artificial caries claimed to have been produced, I think it would be found that the teeth experimented on were of recent extraction, or those in which there was bioplasm, or pabulum. If all animal matter is absent and nothing but lime-salts left, there will be little or no bacterial action, and the caries will be very different from that on the teeth in the mouth. The conditions of teeth in and out of the mouth are so many and various, that unless we are extremely careful we will be deceived and led into error. I am therefore inclined to believe it was animal tissue or pabulum in the mesh-work of the dentine that acted as the factor in the production of the so-called artificial caries.

As it is impossible to produce all the conditions affecting the teeth out of the mouth which we find operating on them in it, it is therefore questionable if the same caries can be produced. I know very well a certain kind of caries can be brought about by artificial means, but when critically examined it will be found a very bogus imita-

tion. Therefore, as stated before, all experiments of this nature can only be decided by the crucial tests of competent co-workers.

Dr. DABOLL: I will say, in answer to Dr. Clark's question, that I think the tooth had been out of the mouth two years.

Dr. CLARK: Does Dr. Miller claim to be original in producing this culture?

Dr. DABOLL: No, sir. He has had the advantages of the best laboratories.

Dr. CLARK: That ought to be stated, because I have seen the same things before.

Dr. DABOLL: We have a society of microscopists in Buffalo, and they wished to meet Dr. Miller and get some points in regard to producing pure fungi. I suppose they thought they were going to be able to do it at once. Dr. Miller explained how he did it, and then said,—"Gentlemen, you must not be disappointed if you don't succeed the first time, for it took me two years to get it."

Dr. SEARLE: I have heard it stated several times here that fermentation and putrefaction were entirely different processes. If this is so, very good authorities have deceived me. I understand putrefaction to be the fermentation of albuminoid substances. I understand fermentation, strictly speaking, to be the change or breaking-up of carbonates,—substances like sugar. I understand that both processes are going on simultaneously in the destruction of the tooth; both sets of organisms are at work,—those which act upon albuminoid substances, and those which act upon carbonaceous substances. If Dr. Miller has succeeded in separating these organisms, he certainly has produced conditions which do not exist in the mouth. It took him two years, we are told, to separate those organisms that are found in the dentine. Dr. Miller has not produced all the conditions in any of his experiments which are present in the living tooth. Therefore I think they are unreliable. Underwood and Milles, in 1877, undertook their investigations, single-handed and alone, pursued their work patiently for four years, and made their report before the International Medical Congress in London, in 1881. I think Dr. Miller was present and heard that paper. Dr. Miller immediately commenced a series of very rapid investigations, and his papers began to pour out like newspapers from a printing-press. He has from the first ignored the reliability of the work of Underwood and Milles, and yet, practically, has added nothing to their discoveries.

Dr. FRIEDRICHS: Will you allow me to correct one word? I think you cannot have read all of Dr. Miller's articles, because I remem-

ber distinctly where he mentions the work of Underwood and Milles, and shows how far they had progressed, and that he had also tried the same experiments they had tried.

Dr. SEARLE: Perhaps I used the wrong words when I said he had ignored them entirely. I meant that he ignored the reliability of their work. Underwood and Milles are deserving of credit for the work they have done in this direction, and when Dr. Miller undertook to deprive them of it, and pass them over by saying, "Priority is not to be mentioned in this matter," I felt justified in thinking that he was trying to aggrandize himself at the expense of some one else. I do not like that spirit. Give every man his due. I certainly am disposed to do him justice. I am sorry that I feel obliged in justice to my convictions to take the position I have with reference to what I understand Dr. Miller's attitude to be.

Dr. DABOLL: I want to say that I do not see how anyone can speak of Dr. Miller as the last gentleman has done. He is the last person in the world to seek to aggrandize himself at the expense of anyone. If you could see him and talk with him, that idea would be dispelled forever. He gives credit to everybody who has done anything in the same line of investigation. He simply claims that he has arrived at a result at which they have not arrived. When gentlemen say, "I don't see how Dr. Miller can produce these things; therefore I don't believe it," I consider that a very negative sort of argument.

Dr. SEARLE: I wish to correct Dr. Daboll. I said I did not see how he could produce the conditions that were present in the mouth; not how he had produced the results which he had, under other conditions.

Dr. DABOLL: Dr. Miller does explain the difference between fermentation and putrefaction. We have putrefaction in the same cavity with fermentation, but we do not have it in the periphery of the cavity; the periphery of the cavity is occupied by the fungi.

Dr. SEARLE: That is just what I say, that fermentation and putrefaction are going on in the same cavity, one in the carbonaceous, the other in the nitrogenous matter.

Dr. SHEPARD: This discussion is, it seems to me, entirely personal, and I object to its going on in this vein.

Dr. BARRETT: That is the very point I desire to make myself. These men who are not acquainted with Dr. Miller and who have—

Dr. SHEPARD: I rise to a point of order. This discussion must not be personal, but with regard to science.

The PRESIDENT: If Dr. Barrett has anything to say that is not personal, we will hear him.

Dr. BARRETT: If you had allowed me to finish the sentence, I would have said to you that we should bring the personality of no man into such a discussion as this. Nothing could be more foreign to the desires and wishes of anyone who is connected in any way with these observations, I am sure, than that personalities should be brought into it. We desire simply to discuss and determine the scientific problems that are to be or that have been solved. As regards the observations of Milles and Underwood, full credit is given to them. They worked up to a certain point. They determined the presence of micro-organisms in the teeth. But for a description of them, for a determination of the physiology and chemistry and life-history of them, another observer has been obliged to take up the work where they left it. The question is, is it necessary that we should have a knowledge of the physiology and chemistry of these organisms, in order to have a full understanding of the subject? I believe that it is, and consequently I believe this matter should be fully taken into consideration. Perhaps it is not necessary for a man to go through some of these experiments himself; but mere theorizations and speculations will not answer. It is necessary to perform some of these experiments before one can speak upon methods. I cannot speak upon methods, because I have not pursued them. I must take the results of other observers when they have laid their processes before me. I believe them to be honest men, and we must all accept their results, unless we go over the ground ourselves. No man who depends upon mere speculation, no man who has formulated his opinions from *a priori* reasoning, has the moral or scientific right to call in question the definite conclusions of competent experimenters and observers who get their knowledge at first hand.

Dr. R. FINLEY HUNT: I do not rise to continue this discussion, but to call attention to the remarks of the chairman of the Section on Physiology, in which he spoke of the factors in the consideration of this subject, and I hope that the circumstances of the last year will not again prevent Section VII. from bringing in a report which will give attention to these other points. And I hope that all the members of the Association will consider those points in the meantime, so that they can come prepared to criticize and judge of the views that are presented on that occasion.

SECTION I.

PROSTHETIC DENTISTRY, CHEMISTRY, AND METALLURGY.

REPORT BY W. H. TRUEMAN, CHAIRMAN.

THE first subject embraced in our Section is artificial dentistry, or, as it is more generally termed of late, prosthetic dentistry. The latter term, while being more esthetic and *perhaps* more scientific, seems to cover that branch of our specialty better, and conveys a clearer idea of it as it is now practiced than did the older names,—mechanical or artificial dentistry,—and it does not savor so much of the "shop." Noting the very slight advance, or even change made in it of late, and the little attention it is receiving, except in those special branches that approach near to, and, in many instances, interlock with operative dentistry, we are led to doubt whether the disposition, so markedly shown, to draw the line sharply between the mechanic of the laboratory and the mechanic of the operating-room is really commendable. However much it may compromise our dignity as professional men, we must admit that our work is mainly mechanical. We recognize the importance of a thorough knowledge of diseases and of remedies, but to the dentist these would be of little avail without mechanical knowledge and mechanical and artistic skill.

In looking over the journals of the past year we have noted but little really new; and but little of interest, except in connection with pivot-teeth and bridge-work; and as in this department so many new ideas have been presented, and so many old ideas have been revived and modified,—some undoubtedly good, and some of questionable value,—we would suggest as a subject worthy of attention, "The preservation of roots, either as supports for artificial crowns, or to preserve the natural contour of the mouth." We might add to this, it is so nearly allied to it, "The repair of badly injured teeth by other methods than filling." These we think are matters of increasing interest. The various methods that have been

presented from time to time to avoid the inconvenience and annoyance attending the wearing of an artificial denture as usually made, require careful study and an extended trial before we can pass a fair judgment on their practical value.

In this connection we notice a method suggested by John G. Harper, of St. Louis, Mo. (*Archives of Dentistry*, January, 1884), for obtaining the model of a root on which to fit the band or collar or ferrule used in some methods of pivoting. He takes a piece of annealed steel wire, No. 27, passes it around the root at the point which the band is intended to fit, and, bringing the ends together, twists them until the wire is drawn tight and fits the root "snug;" this gives us a ring of steel wire, fitting the root accurately. Remove this carefully and lay it on the previously smoothed end of a block of close-grained wood, and with one blow of a flat-faced hammer drive the ring into the wood. This is said to give an exact model of the circumference of the root on which the band is to be fitted. After the band or collar is fitted, he further utilizes the arrangement to cut out the cap to fit into it, by laying a suitable piece of gold or other metal on the block, and laying the wire ring on this, with a sharp blow of the hammer cuts the plate the exact size and shape, ready to solder into the collar or band.

We see noticed in the journals a non-metallic compound suggested for dies to be used in a screw-press to form metallic plates. The use of a screw-press for this purpose is quite ancient, but the compound known as "Spence's metal," "Darcet metal," and by various other names seems to be new. From the descriptions given, its value as a substitute for metallic dies is doubtful, but it may perhaps be useful for models on which to adjust pivot-teeth and bridge-work. It is said to melt at so low a temperature that it can be poured into wax impressions. If it gives a cast as accurate as plaster and as hard as reported, it will be valuable. So far as we know it is not yet on the market in this country; nor yet has the formula for its preparation been made public.

Mr. Geo. Burton, in the *British Journal of Dental Science*, Feb. 15, 1884, gives a new method of working vulcanite. He packs his case—in a way not clearly explained, but—without a flask; then covers the rubber with tin foil and places the case in an iron box, and packs pulverized steatite around it until the box is full. This is placed in the vulcanizer and vulcanized. He claims for this method far greater cleanliness, a saving of time, and a better and stronger plate than by the usual method.

We recently noticed in a dental journal an article entitled "Is it honest?" The writer, referring to the re-introduction of a style of work known as "continuous-gum facing,"—a combination of continuous-gum and vulcanized rubber,—calls attention to its liability to accident and the difficulty attending its repair,—even a slight accident to the porcelain portion making it necessary to remake the case, and entailing nearly as great an expenditure of time and labor as did its original production, and asks, "Is it honest to make for or recommend such work to our patients?" He adds, "The dentist making such a case, for his own reputation's sake, might repair it at a slight expense, and pocket the loss; but what redress has the patient if he (the dentist) is at a distance, or perchance dead?" This seems a pointed and natural question, and one well worth considering, not only in connection with the style of work immediately in question, but also other expensive operations, notably some forms of bridge-work—tedious alike to the operator and patient, and entailing on the latter a large expenditure of money and endurance. The probability of accident, and the difficulty of repair in the absence of the original constructor of the work, we submit, are worthy of serious consideration.

We also call attention to a recent contribution to prosthetic dentistry by Dr. E. M. Flagg, of New York. A few years ago Dr. J. Foster Flagg, of Philadelphia, published in the *Dental Cosmos* a series of articles upon dental pathology, in which he treated at length the various temperaments and their relation to dental science and art. Dr. E. M. Flagg has culled from them and tabulated those portions—which we may perhaps term "expressional"—bearing upon the form and peculiarities of the individual, and their relation to the form, relative size, shape, character, color, and arrangement of the teeth, with especial reference to the selection of artificial substitutes.

While the tables prepared are only to be considered as they were designed to be, suggestive,—for there are many things to be borne in mind in selecting a set of teeth that *cannot* be expressed, and few that *can be*,—we consider them worthy of careful study. The doctor has shown great care and a thorough knowledge of the subject in collating and arranging them. Already his work has borne fruit, and and we have exhibited at this meeting* sets of teeth typical of the four primary classes of temperaments. These are skillfully and

* Exhibited by The S. S. White Dental Manufacturing Co.

artistically mounted and will bear a close examination. It is well to keep in mind in this connection that we do not put teeth into the same mouth from which we extract them. The mouth belongs to the same individual, but the changes that follow the loss of the natural teeth are so great and of such a character that the teeth that originally belonged to it could not by any possibility be put again in the same position and produce the same expression. In some respects we may follow nature too closely; we are compelled in practice to compromise some points. We may refer in illustration to the smaller arch of the edentulous jaw, necessitating a smaller tooth and less masticating surface,—especially upon the lower molars,—and the changes in articulation made necessary to favor stability.

The Section also reports two papers, by Drs. John Allen, of New York, and J. A. Robinson, of Jackson, Michigan, respectively.

Under the head of chemistry, the Section would report having received a communication from Dr. W. B. Ames, of Chicago (a member of the Section), in which he says: "During the last year I have been making some experiments upon the application of electro-chemistry in the mouth. One very satisfactory result has been the bleaching of pulpless discolored teeth by the electro-decomposition of a solution of sodium chloride within the cavity of the tooth by means of a galvanic current and fine platinum-pointed electrodes. Also, the disinfection of canals containing putrid pulps, by the decomposition of water acidulated with sulphuric acid,—one minim to the ounce,—within the putrid mass. This can be accomplished by passing the galvanic current from a finely-pointed platinum annode placed in the canal containing the acid solution, to a sponge-covered cathode, placed upon the mucous membrane adjacent. The electrolytic is generally much simpler than the chemical process of decomposing compound bodies, and especially is this the case when the decomposition is to be carried on within the oral cavity."

SECTION I.—Continued.

Artificial Dentistry.

PAPER BY J. ALLEN, OF THE SECTION.

WITH comparatively few exceptions, the department of artificial dentistry requires more special attention than has been bestowed upon it for some years past. Consequently, we deem it proper to suggest more thoroughness in this branch of our profession. Many important points should be kept in view by the dentist when he is required to construct artificial substitutes to replace the loss of the natural teeth.

When consulted upon this subject by our patrons, we should carefully study the requirements of each particular patient; for there are no two cases alike, and a set of teeth that would be well adapted to the mouth of one person in point of utility, form, and expression, would produce great imperfection, and even distortion, in the mouth of another; hence the great importance of the most careful discrimination between the various requirements of different persons in this branch of dental practice. The different functions of the natural teeth with reference to mastication, enunciation, articulation, and restoration of the natural form and expression of the mouth and face should all be fully considered.

From the taking of the impression, through all the different stages of the work to the final completion of a denture, various causes may occur which might prevent a successful result. Therefore, in order to avoid a failure from any of these causes, let us look for a moment at the acquirements necessary for one to possess who is to replace those organs which nature, with all her perfection, had previously formed; for, whatever be the mode employed, he will have to learn that it is the height of art to conceal art.

This, together with practical utility, should be the great point to attain in the construction of artificial dentures. To reach these points requires the skill and perception of an artist, the manipulation and experience of an expert, together with thorough mental

training and scientific research. Hence the impropriety (as we think) of calling this branch of our profession *mechanical* dentistry; for, according to our best lexicographers, a mechanic is one who constructs the products of some mechanical trade, requiring the rule and scribe to work by, in order to produce perfect uniformity in his results. But the skillful dentist carefully avoids this mechanical sameness, for he has no two cases which require the same form; consequently, this branch of his professional duties pertains more especially to that of the artist, whose powers of perception and discrimination enable him to see just what is necessary to meet the various exigencies involved in his operations. He has no fixed forms or rules by which to be governed, as the mechanic has; but he encounters some new phase in each succeeding case, as, for instance, in the length, size, form, position, and adaptation of the teeth, together with the lighter or darker shades and tones of the teeth and gums, all of which should be of a character suited to the age, complexion, and expression of the person for whom they are intended, thus producing one harmonious blending of all the features of the face of his patient.

To do all this, the operator must possess a knowledge of several branches of art and science.

Among these, he will find the elements of chemistry essential, with reference to the hygienic properties of the materials he employs and the means of preparing them for dental purposes.

He must also know the nature and properties of the various metals and minerals used in dental practice, together with the art of converting them into artificial dentures, especially if he does continuous-gum or block work. Our dental colleges and the community require of him a knowledge of anatomy, physiology, chemistry, and therapeutics, together with the principles and practice of dental surgery. He must also possess mechanical skill, which involves an insight into several trades, such as working the precious metals, modeling, molding, casting, etc., etc. In short, he must be a sort of compound man, embodying the knowledge of several branches of business, in order to perfect himself in artificial dentistry. With these acquirements, we claim for him a position in the front rank of his profession.

But it is evident that very many of those who construct artificial dentures do not possess all these qualifications: that they are not artists; that their artificial work has not that graceful and life-like appearance which characterizes the natural organs; that there is a

want of proper tone, expression, adaptation, and practical utility; and that their dentures exhibit only a stiff, mechanical appearance, that enables every beholder to spot them at once as artificial teeth. Such men must occupy the subordinate position of mere mechanical dentists, whose claims to supremacy are very small, and whose merits are still less.

In order to remedy this evil, let those who are below the proper standard ascend to the higher ranks, bringing with them science, art, and skill, gathering all along their pathway here a little and there a little, in order to fill up the great storehouse of knowledge from which success must flow.

In reference to the various modes now in use, they all seem to have their place, and may be adopted under the different circumstances attending particular cases. When consulted, the operator should examine carefully, and then decide as to what method will secure to the patient the greatest degree of practical utility and personal gratification, and then advise accordingly, bearing in mind that whatever be the mode skill, taste, and judgment must preside over the operation, for there is no system so perfect as to render these unnecessary, and the further the method is from yielding results true to nature, the harder will it be for the dentist to construct his work so as to elude detection in the mouth.

In this respect we have been able to approach much nearer the acme of our ambition by means of the continuous-gum system than with any other with which we are familiar; but, as this style of work speaks for itself, nothing that we could say by way of eulogium would add to its merits.

We would therefore suggest that as this branch of our profession seems to require a higher standard of qualifications than has heretofore been possessed by some dentists, who seem to study how to do the cheapest rather than the best work, we deem it proper to urge upon them the importance of bringing into requisition a much higher order of talent in the artificial branch of dentistry than our present records indicate; for this low ambition always has a downward tendency, and will place its votaries where they surely belong, —upon the lowest platform of their profession.

Now, while we can look with pride upon the advances that have been made within the last few years in the other branches of dental practice, let our efforts be also directed to the advancement of the artificial department, that it may equally merit popular commendation.

SECTION I.—Continued.

Who are Dentists?

PAPER BY J. A. ROBINSON, OF THE SECTION.

I HAVE chosen as a motto for this paper the words of Pope:

> "Be not the first by whom the new is tried,
> Nor yet the last to lay the old aside."

In a profession scarcely twenty-five years old in *national existence*, and one that has been formed among a people of the largest liberty under republican institutions, it is proper to inquire into the competency, character, and integrity of those who call themselves dentists, and see what qualifications are requisite for the discharge of the several duties they must necessarily perform, and of the general operations required of them in the daily practice of their calling. Because a dentist has made a set of teeth which have been worn with a tolerable degree of comfort, and which look respectably well in the mouth, it does not follow that he is a *good dentist;* neither is it certain that because he has filled a cavity in a tooth with gold or any other material which seems to do good service that he is competent to do good dentistry. By dentistry in this sense, I mean the repairing and restoring of teeth that are decayed and the supplying of artificial substitutes. This latter branch constitutes the artistic and scientific part of our profession. There is poetry or art in the shade, color, and appearance of a set of artificial teeth; and science in their organization, adaptation, and articulation. These combined constitute the philosophy of dentistry. A set of artificial teeth to appear natural should seem as though they grew as the trees grow, from the inside towards the outside, and, falling posteriorly on the ridge and on the cutting edge, like the perspective of a painting, give the work the appearance of nature. The natural teeth are neither oblong nor round: the molars are octagonal, with the posterior buccal section falling away and shortened towards the back part of the mouth;

the bicuspids are wedge-shaped, like the stones that form an arch in any mechanical structure; and the incisors a little more round, but still retaining the wedge-shape toward the palatine surface of the mouth. An artificial denture, to present a natural appearance, must approximate the rule laid down in this description.

Without scientific principles art is not art, and everything is a bungle. True art is poetic as Apollo and scientific as nature. The true artist lives in perennial glory in his labor or his imagination, for labor is the visible form of the imagination. Anything short of the scientific never fills the whole mind, but only the more superficial part of it. It is also true that the real artist is never satisfied with simply *what will do;* for it is not the culmination of his highest thought. He is not satisfied with what he does occasionally from a good impulse, unless he has at the base of that impulse a sure and scientific end. Without this scientific principle all the labor bestowed upon a set of teeth is only elaborate nonsense, for they never satisfy the uses they were intended to serve. We do, indeed, sometimes find in nature a physiognomy of the teeth that does not seem to correspond with the physiognomy of the face, but that is only when nature has been obstructed in her endeavor to be true to herself, and it is seldom that good and perfect teeth, however homely, can be substituted by an artificial set, without the loss, in some degree, of the original character of the face,—so true is nature to her divinity.

Diversity and inequality oftentimes tend to beautify and adorn; it is certainly so in nature; hence the dentist must have a certain aptitude out of which this science and art may be evolved. A man may possess two qualities that may be equal and yet different; as, he may be an artist and a mechanic at the same time; but it is the combination of these two qualities that makes a good dentist, as the combination of the poetic and the scientific is essential to constitute an artist.

One of the essential things for a dentist to know is how to make his own instruments, even with the vast variety now in the market. Our instruments are so delicate that they are easily broken, and we cannot do good work with dull tools. I see that instrument-making is made a specialty in one of the dental colleges. We must know how to make instruments in order to be able to repair them; and we must know how to keep them in order. We cannot dwell too earnestly on the importance of stone-burred serrated points for the absolute welding of cohesive foils. One who has not tried the experi-

ment would be surprised at the difference between dull and sharp serrated instruments. The latter give strength to the filling to stand hard work in mastication and to resist breaking, in the incisor teeth, which is impossible with the former. In a perfect filling all the parts must cohere; they must be self-supporting and supported, and it is impossible to effect this without perfect instruments. The instrument is the vehicle of labor, and bears the same relation to labor that the car does to the railroad. There are no two operations that are alike or that require the same manipulation, and of course they require different instruments.

Now, it may seem strange to those who have not given the subject thought that the essentials of dentistry are the poetic and the scientific combined. It is only because these words have not been commonly used; though dentistry has often been called an art, and is to-day fast passing into a science. The true artist is always filled with a silent admiration for his work. Even the dumb, inarticulate material seems to have a pulse that beats in harmony with his own, and he is filled with a conscious power of his own possibilities until his thought passes into deeds. The undulations flit before his vision, and the material will march like files of soldiers to fill the imperfect forms until they seem to become spirit and leap out into life. There is nothing mechanical in the appearance of the work, though it is mechanical in execution. In good dentistry these principles are hidden in the naturalness of the work, as in nature herself.

The great thing to be avoided and shunned by those who are in position and power,—those who are leaders in the profession,—is, in all meetings like this, the appearance in discussion of dictation on the one hand, and dilettanteism on the other; for only the earnest soul will be beloved, and only the gentle and modest soul will be revered by those who are striving to follow and learn.

True art must appear natural and living, and be according to the laws of the living. All living things are according to mechanical and geometrical laws, and nature is perfect art. Upon this platform we must build, for it was upon this platform that the world was built.

It does not seem possible for a bad man to be a good dentist, for a bad man's heart cannot conceive the real truth; and what the heart cannot conceive, the hand can never delineate. Bad passions are always pushed aside while we hold communion with art, for we are filled with a divinity. The artist-dentist is learned, though he may never have been schooled; he has graduated, though he may never hold a diploma.

Now, it seems to me that there are many good operators among our older members, who began practice before the facilities for obtaining an education were what they are to-day, whose circumstances have precluded the possibility of a graduating course, but who have so lifted up dentistry by their genius and inventions that some acknowledgment of their labors ought to be made by the profession. They have done good work *outside* of the schools; they have graduated themselves; and, as in the other professions, the title of L.L.D. is conferred upon those whose labors have helped the world, so might the distinction of a title be properly conferred on these. There are some meritorious persons whom I have met within the past few years,—some grand men,—who are so sensitive that they prefer to remain outside rather than sit with those among whom they fear they are not welcome. A small ceremony like the one I have suggested, or a broad invitation that would declare to such persons that we are not exclusive, would open a door that would bind us in a brotherhood,—that would make us stronger, more generous, and grander. Justice, when it asserts itself, embodies itself in deeds. The great charm of men, or of professions, lies in their moral rectitude.

We have thus far only considered the dentist as a mechanic and artist. Let us now try and look at him in a more practical point of view, and, as some think, a higher,—in the capacity of physician and surgeon of a specialty. It is not a fiction of fancy to say that a man is not a dentist unless he is master of his whole calling, and that relates to the cure of the diseases of the mouth, and remotely to the whole system. The surgical operations in the mouth, and especially those on the teeth, are in the main simple, when well understood, though sometimes difficult to perform: but they are all-important in their relation to the well-being of the whole physical man. You will observe how closely the physician is allied to the artist and the scientist in the diagnosis of his cases; and the surgeon to the mechanic and the philosopher. This higher calling is growing upon the profession day by day, as the profession is growing in the community.

Perhaps it may not be out of place, and I may be allowed to digress far enough at this time, to suggest a few things that seem to me to be fundamental to our very existence and standing, and as essential to securing acknowledgment in this nineteenth century civilization.

If the education and culture of the children are essential to the

well-being of the government, the physical system is essential to the man; and to conserve it is the work of the physician, the surgeon, and the dentist. Hence, as we have to live, the care of the teeth seems to be of fundamental importance. It will no longer be necessary to extract the teeth when parents can be impressed with the fact that they are essential to the health and well-being of the child; and since we have the aluminium disk and the corundum powder, it seldom becomes necessary to fill children's teeth on the approximal surfaces, if taken in season, as the decay is readily polished off on the "Arthur plan." This method is particularly applicable to the posterior molars of the first dentition, and to the anterior surfaces of the first molar of the permanent set, and I have no doubt that it is better practice in incipient decay than to incise by drilling, as is often practiced in shallow cavities. For many years I have practiced the Arthur plan in inferior bicuspids, and often in superior, with great satisfaction. The painlessness of the operation will never disturb the child, and that is very important in the treatment of the young.

The most desirable attainment to be reached is the *painless operation*. Something needs to be discovered that will bear the same relation to removing decayed dentine and highly inflamed bone-tissue that anæsthetic agents do to tooth-extraction. This being found, there will be more frequent examinations and operations with advice from the dentist, because there will be less dread of pain. The most effective agent I know for this purpose is composed of equal parts, by weight, of caustic potash and carbolic acid, braided together into a crystalline paste, and applied to the cavity before the cutting is commenced, and then again after the loose decay has been removed. If you desire it less pungent the quantity of caustic potash may be reduced, or you may wipe it out with carbolic acid. The pain, which is very slight at first, soon passes away, and then the cutting is painless. My theory of the action of this medicine is, that the application coagulates the fluid in the tubuli, and renders it incapable of transmitting sensation to the nerve in the pulp, but does not destroy it. Both these agents are antiseptic, and both escharotic, but the acid and the alkali combined form a salifiable base that is perfectly harmless to bone-tissue, and gives almost immediate relief to that most disagreeable of all feelings caused by preparing cavities for filling. If the pulp is exposed, the slough is removed almost instantly, and an eschar is formed so delicate that it heals by first intention, and when that is covered with any of the

oxyphosphates now in use the vitality of the pulp is preserved and the tooth is saved. The only thing necessary is *care*, and the work is easily accomplished by filling the tooth in *sections;* that is, filling one-half the cavity without removing or displacing the cap, so that the dust of the cap will not irritate and inflame the pulp.

The bacteria theory must now be considered an accepted fact, as the best practitioners are full of experimentations with their antiseptics, and that mode of practice presupposes the septic or putrefactive condition of disease; and it is an acknowledgment of the presence of bacteria. Chloric acid has thus far resisted every effort to decompose it. It is contained in the buccal fluids of the mouth, and manufactured from the salt contained in the food, and is antiseptic. The lactic acid and oxalic acid that ooze from the marginal gums of neglected teeth and the septic condition of the uncared-for mouth, with the oxygen taken in with the breath, and the saccharine nature of the food, furnish the necessary conditions for the propagation of bacteria that destroy the teeth and gums. Now, when the chlorine contained in the buccal fluids or manufactured from the salt in combination with the acids in the mouth comes in contact with *tin*, it is set free and unites with it and forms chloride of tin, which is antiseptic, and protects the organic matter from decay; and hence tin becomes the best preservative material for fillings known to the profession. Food thoroughly masticated becomes filled with the fluids of the mouth containing chloric acid, and is less liable to become septic; hence the teeth of persons who chew their food well are less liable to decay, because of the condition of the food, as well as because of the friction caused by mastication *and deglutition.* Perhaps the nutritive fluid passing through the tubuli containing chlorides, acts internally upon the tin fillings as well as the fluids of the mouth upon the surface, so that the whole filling becomes antiseptic. This constant effort to reproduce tissue and to resist dissolution lies at the base of all evolution, and when we can rightly diagnose disease and assist in any way to promote health, we add another link to the chain that lengthens human life.

When we get outside of the domain of fact, we base our hypotheses on appearances. The infinitesimal *cause* of disease, and its infinitesimal *cure*, are in many cases beyond mentality. We may be certain, however, that amalgam fillings are failures whenever the cavity runs beyond the free margin of the gums. Amalgam fillings are neither antiseptic nor escharotic, and the shrinkage will form a subterranean crypt between the walls and the filling, pro-

ducing a compound cavity that deceives both patient and operator, and becomes the natural nursery for the promotion and growth of bacteria. Amalgam cannot be drawn over towards the borders of the cavity; and the moment crystallization begins, that moment the borders become a refuge and home for the bacteria.

There is a something beyond microscopic examinations or chemical experimentations: as much beyond as being is beyond existence, or spirit beyond matter.

I think the experience of the profession will bear testimony to the excellent qualities of tin as a filling; but the labor required to insert fillings of tin in many places brings into use amalgams, gutta-percha, and oxyphosphates, and thus, subsequently, the loss of many valuable teeth occurs.

Tin has less elasticity than any other of the metals; when bent, the crystals break or separate, and produce what is called the "cry of tin;" but, combined with platinum and gold, the compound is more ductile than pure tin, and harder when burnished or malleted, being capable of resisting attrition, even when attenuated near the borders of the cavity.

After three years' experience with such materials, I do not know of a single failure or leakage in a filling in my own practice, and I deny the necessity of extracting any tooth, that (as Dr. Morrison, of St. Louis, says) cannot be *taken out with the fingers.*

The bane of all the professions is the love of ease and the unwillingness to work. Show me a single person who has made large attainments without labor, and—in our own profession—hard labor, both mental and physical. Point to a single artist of eminence who has not toiled early and late, or to a scientist, a physician, or a surgeon,—for they are substantially the same, when devoted to their calling.

The true artist is so filled with the love of his calling that he has no time to be selfish and to think of things as belonging to himself; but in serving his calling he loses himself in his profession, and his ledger accounts are neglected; and that is the reason why so many of our best operators and thinkers are so poor.

Now, it must be apparent to every one that there are a great number of persons at this time who have the sign "Dentist" over their door who are totally unfit to practice our profession, and the "examining boards," established by law that has kept pace with our civilization, are the only power that can winnow these out and decide who are dentists. In this strife of the survival of the fit-

test the hottest battle must be waged. It is so in all nature: those who are best adapted will be preserved, and the others must perish. This law runs through the lower forms of animal life, and is true of ideas and character. It will require the soundest wisdom, coupled with justice, to discriminate, classify, and decide who are valuable and who are worthless. We must expose all shams, with a heart full of love and human sympathy for the good and a hatred for all that is bad. Those who prune with care strengthen the parent stock. It is a law older than man that has decreed that the best must live, and also that when the whole carcass is rotten it must be destroyed. I am aware of the difficulty, and that we shall often be misjudged and blamed; but he who pulls the weeds strengthens the corn, and does it because he loves the corn the best. So we must discuss the merits of men as we would a problem in geometry. If we are wise we shall all put ourselves in training for the work that is before us.

In closing, let me say to those who occupy high positions in the profession, let us hold out the hand of brotherhood to all meritorious operators, whether educated in or out of the schools—if they are *educated*—until we are a united whole, never to be broken, whose light shall illumine the world.

SECTION II.

DENTAL EDUCATION.

REPORT BY C. N. PEIRCE, CHAIRMAN.

THOUGH the annual reports of Section II. are not to be received as exact chronicles of the actual progress attained in the educational field, they may be accepted as fairly reflecting the general tendency of thought among the friends of higher education. That the actual progress made falls below the ideal advancement is to be expected. It is rare that the practical application of a theory is contemporaneous with its promulgation. But that there have been real, solid advances in the methods of imparting knowledge and in the standard of qualifications is not to be doubted.

The exhaustive discussions which have been had upon this subject, stimulated by previous reports from this Section, show the importance of the position which the educational problem occupies in the minds of the members of the profession. The fear so often expressed lest the seeming apathy and failure to appreciate the responsibility of their position evinced by some teachers should issue in disaster, testifies to the general anxiety that no backward steps be taken. This anxiety, which has been intensified by the immature standard of graduation revealed in the annual announcements of some of the schools, has seemed to warrant the disappointment and discouragement felt and expressed by many sincere members of this Association. But, notwithstanding these untoward indications, the cause of dental education has progressed. At no previous time were the opportunities afforded to students for the acquirement, before graduation, of proper qualifications for practice equal to the present. Never before was there so general a desire among the schools that their curriculum and standard of graduation should represent the highest degree attainable; never before was there a time when the representatives from the schools could have formed an associa-

tion and adopted resolutions with almost perfect unanimity, abrogating customs which have been in vogue for over thirty years.

Thirty years ago the regular sessions of the best schools comprised at most only four months' instruction, and, by allowing one month's grace, this was frequently shortened to three months; and even with this limited time, two fundamental branches, anatomy and physiology, were embraced in one chair. The regular course of lectures in the same schools now extends over five months, and opportunity is afforded to the student, by means of auxiliary spring and fall courses, for five months' additional instruction in the year. The chairs of anatomy and physiology are occupied by different professors, each giving a full illustrated course on the subject under his care.

There have also been equally marked advances in the standard of requirements for graduation. To compare the acquirements and qualifications of the average graduate of to-day with those of the men who received their degree of D.D.S. from the same schools twenty years ago, would certainly be a source of encouragement to those who have so long labored for the enhancement of educational opportunities.

The Section also notes, as an evidence of interest and progress in dental education, the increased efforts which are being made in the several States to procure legislation for the regulation of dentistry. These efforts have resulted, so far, in the enactment of laws in many States for the protection of the citizens against charlatanism. For the better enforcement of these laws, examining boards have been established, which, for the purpose of increasing their efficiency, have in turn organized a National Board of Examiners. The proceedings of this body, which were epitomized in the last annual report of this Section, are an earnest of its labors.

As a further evidence of the interest felt in education may be mentioned the late meeting of the faculties of the several schools, called for the purpose of establishing, if possible, an advanced curriculum and a uniform standard of graduation, and of effecting the organization of an association of the colleges. The result of the labors of this organization, which has just held several sessions, are epitomized in the resolutions adopted, as follows:

Resolved, That after the session of 1884-5, the colleges belonging to this association shall require attendance upon two full courses of lectures previous to the student's coming forward for graduation; *provided*, that these two courses shall have been attended in separate years.

Resolved, That after the session of 1884-5, the possession of a medical diploma from a reputable medical school be accepted as equivalent to one course in dentistry, the holder being required to pass one year in a dental infirmary, the year's study to include a course of lectures in a dental college, before coming up for graduation.

Resolved, That one course in a medical college be accepted as equivalent to one year's pupilage in a dental office, but one-year medical students shall be required to attend two regular courses of lectures in a dental school.

Resolved, That we recommend that a preliminary examination be required for entrance to our dental colleges. Such requirements shall include a good English education. Candidates holding the diploma of a recognized college, academy, normal or high school, or other evidence of literary qualification, may be received without examination. In case of any student's failing to pass a satisfactory preliminary examination, the other colleges of this association may be informed of the fact.

Resolved, That we agree to adopt a graded course of instruction and an intermediate examination, which course of instruction and examination shall be conconducted as the faculties of the different colleges in this associatiou may deem proper.

We recommend that the following subjects and arrangement be adopted by the colleges of this association, viz.:

First Year.—Anatomy, with dissections; Physiology, Histology, Chemistry, —didactical and practical; Mechanical Dentistry.

Second Year.—Review of junior year studies, Pathology, Surgery, Materia Medica, Therapeutics, and Operative Dentistry.

Although the facts we have mentioned indicate the progress that has been made, we are not to cease from our efforts to achieve still further advances. What has been done but widens our field and increases our responsibilities, and step by step with the improvements in the opportunities for acquiring an education comes, with even longer strides, the evolution of the profession as a whole and of the needs of its clientage. This day is demanding from those entering upon the study of dentistry a broader intellectual development; a sounder, more substantial knowledge; a keener, more critical judgment for the study of cause and effect as revealed in the histology, physiology, and pathology of our specialty; a more conscientious personal responsibility; a more wholesome moral standard; and last, but not least, a clearer appreciation of the worth and wealth of our calling. The means by which these qualities may be made to enrich the future of dentistry and maintain its continued growth in dignity and worth, is an interesting and important question, not alone for the consideration of the college faculties, but worthy of the careful thought of this Association.

Of the three hundred and sixty-five (365) students graduated within the last five months from the twelve principal dental schools in this country, 5 per cent., or eighteen (18), will, by the end of the first year after graduation, have dropped out of the profession; and by the end of the second year nearly as many more will have sought other occupations. Of the three hundred and twenty-eight (328) left, not more than 5 per cent., or sixteen (16), will be recognized at the end of five years as actively interested in the scientific aspect of their profession. These figures, of course, do not represent accurate statistics of the classes just graduated; but they understate, rather than overstate, the facts regarding average classes of previous years.

The results observed, in the estimation of Section II., are due somewhat to the following causes: Every year numbers are added to the profession, whose deficiency in the elements of an English education operates sadly against their becoming proficient, and this condition must always remain an obstacle to the progress of such and a modifying influence on the progress of their associates. Then there are those who have exquisite manipulative ability, but to whom text-books and lexicons are but a confused mass. With this class manipulative skill and precision are acquired as the result of observation, industry, and patience; but these, though desirable accomplishments,—indeed, essential to the skilled artisan,—alone never make the educated dentist. On the other hand are those to whom theory and principles are a delight. The *why* and the *how*, to their *minds*, are as trite as the alphabet; but their *fingers* continuously and utterly refuse to respond to culture. To these, success is as impossible as to the former class, because they are unable to acquire the requisite amount of skill in the operative and mechanical departments.

What is needed to remove, or modify, these causes of failure is the adoption of some method by which the fitness of those entering the profession may be known. An appreciation of the demands of the profession, and a realizing sense of the necessity for the adaptation of the individual, in capacity and inclination, to these requisites, as well as a high sense of personal responsibility and an exalted moral standard, would tend greatly to lessen the proportion of those who waste years in fruitless study, and to increase the number of those who come to the front as educated dentists, and would thereby enhance the literary, scientific, and social status of the profession.

This Association has frequently discussed the propriety of the

dental schools establishing preliminary examinations and requiring attendance upon two full courses of lectures, without regard to previous practice, before admitting students to examination for the degree of D.D.S. If the suggestions and restrictions embodied in the resolutions previously adopted can all be carried out in the spirit and intent with which they have now been accepted, they will cercertainly prove important factors in the cause of progressive education; but while faculties are dependent upon the fees received from students for the necessary college expenses and their meagre compensation, it will require encouragement and care to make them more than a dead letter.

In reaffirming its faith in the wisdom of the resolutions heretofore adopted by this Association, Section II. is not unmindful of the fact that recommendations of the American Dental Association are in no sense mandatory upon the governing powers of the various schools; but, formulating as they do the deliberate judgment of the highest representative body of dentists, their practical application is only a question of time. But does our responsibility end with the formulation of principles for the guidance of the colleges? May we not hope, by judicious effort in other directions, to stimulate a thirst for higher attainments—a broader and more thorough culture? Can this body do nothing more than is being done to enhance the status of its own members? Is individual research recognized and appreciated to the extent of its worth and influence? Are we offering all of the incentive to original research and careful observation that is possible?

Section II. offers these inquiries, trusting that some way may open for further encouragement and a realization of something nearer an ideal association.

DISCUSSION.

Dr. SPALDING. Are graduates of medical schools admitted to graduation on one course of lectures?

Dr. PEIRCE: The resolution passed by the association of colleges is that gentlemen having graduated from reputable medical schools shall, upon spending one year in the infirmary, including a full course of five months' lectures in the dental school, be entitled to go forward for examination and graduation, and that those who have taken only one course in medical schools be required to take two

full courses in a dental school before they are eligible for graduation.

Dr. SPALDING: I will only occupy the time as to one particular point. I am very glad to know that the progress indicated by this report is being made, and that a higher standard of dental education is likely to be attained, after this year, at any rate. It has my most cordial indorsement, and the only objection I have to the resolutions which they have passed, is that they admit a man holding a medical degree to become an authorized practitioner of dentistry by attending one course in a dental college, including one infirmary course.

Dr. PEIRCE: He must have spent a whole year in the infirmary.

Dr. SPALDING: I don't care if it is a whole year. I say a man who has simply graduated in a medical school is not as well fitted or as competent to become a skillful dentist in one course as a man is who is a good chemist and a skilled mechanic. A man who is a good chemist and a skilled mechanic will make a better dentist at the end of one course than any man who has simply gone through with a medical course. I want to make that point, and to make it strong, because I believe it is an important one. We have had a great deal too much of that kind of thing. All I want and all I ask is that a dentist shall be well qualified to practice his profession before he enters upon it. I don't want to let men in who are not qualified, while those who may be better qualified are shut out on technicalities.

Dr. R. FINLEY HUNT: I wish to express my gratification—which I certainly think will be shared by all whose hearts are set on the elevation of our profession through the elevation of the standard of dental education—that a stride has been made by the colleges of the country toward harmonious action in this common cause. This meeting of the dental faculties was looked forward to with a great deal of anxiety for fear that differences of opinion on the part of the representatives of the different colleges would result in obstruction of this work which is being done. I consider that a great deal has been accomplished in the results of the action of the association of faculties, as set forth in their resolutions. Like the gentleman who preceded me, I feel that some things have been done not as well as they might have been, but there has been so much done that we all ought to be grateful, and we should have confidence that these gentlemen who have done thus far so well will be able to see the imperfections and defects of their action, if there be any, and correct

them hereafter. I am very glad there are authorized bodies now who can regulate the matter of dental education. It seems to me that they are constituted just as they should be; that is, in the association of faculties of representatives of the various colleges on the one hand, and in the association of national dental examiners of those who represent the State societies on the other. I understand that this step has been taken to secure harmony of action between the associated faculties and the association of dental examiners. Let us all hope and pray that their action may continue in the state of harmony which has characterized their proceedings thus far. Then we may be justified in expecting that the best results from their labor will ensue. This Association should give them every encouragement to persist in their work of bringing the profession of the country, in point of education and acquirements, up to what this Association has desired for so many years.

Dr. FRIEDRICHS: I entirely disagree with the views expressed by a previous speaker in regard to according no privileges to a graduate of medicine. I think that when a man graduates as a doctor of medicine he has already derived authority to practice dentistry, if he so desires. I think that the action of the faculties was very wise in adopting that clause offering that inducement to graduates in medicine who desire to become dentists; because we know very well that where men practice dentistry without this qualification they often make poor dentists. Therefore, I think it is the duty of the Association to support the faculties in these resolutions as a whole.

Dr. ALLPORT: I wish to thank this Section for the report which has been made, and especially do I wish to thank the dental college association for that particular point in the resolution that they have adopted. It comes more nearly up to my idea of what our colleges should be and what they should require than anything ever done before. It has long been a favorite idea of mine that all practitioners of dental surgery should be specialists in medicine, and should be so regarded,—that is to say, I believe that, when a man treats any organ of the body, his knowledge should be laid in the science of medicine. Dentistry is not a profession, nor can it be, except as it is medical, and in proportion as it is medical is it a specialty in medicine. Why, therefore, should we ignore or speak slightingly of a medical education; for, take away the medical part of dentistry, and it becomes a mechanical pursuit and nothing more.

Surgery could not be made a profession without the accompani-

ment of a medical education. Otherwise it is mechanical; there is no science about it. I wish, therefore, to thank this Section, as well as the dental college association, that they have recognized medicine as having something to do with the practice of dentistry. I am not one of those who believe that a simple education in chemistry and mechanics will make a better dentist, after two years' training in a dental school, than a thorough medical education will do with one year in a dental college. Those thus educated may start out as better manipulators. I will admit that; but they cannot have, and few will ever acquire, that foundation for a scientific practice of dental surgery that they would possess if they had first obtained their medical education.

This is a step in the right direction, and so sure as the sun shines the time will come when all dentists will be required to be medically educated.

Dr. SPALDING: In this matter of preliminary medical education, it seems to me that the cart is put before the horse. Let us perfect ourselves in dentistry, and then, if we choose to adorn ourselves with a medical education, all very well. The difficulty is that we attempt to lay the foundation in the science which does not include our own at all, or, if at all, only to a small extent. What is the difference between dentistry and medicine? Dentistry includes anatomy, physiology, chemistry, and special pathology and therapeutics. It does not include an accurate knowledge of obstetrics and gynæcology, nor an accurate knowledge of fevers and the like. The foundation principles upon which dentistry rests are anatomy, physiology, and chemistry, including also special pathology, therapeutics, and materia medica, with what we call operative and artificial dentistry. These compose the basis upon which the science of dentistry rests. If medicine can add anything to it, we are very glad to have it; but why should we educate ourselves, or require others to educate themselves, in branches that do not essentially belong to our profession? Why should we educate ourselves in non-essentials first, and in essentials afterward? Let us have the essentials first, and then, if other things can be added to advantage, that is a good thing.

Dr. COOK: I would like to ask the gentleman if he will give us what he conceives to be the foundation of a medical education. What is, commonly speaking, actually understood by the general medical practitioner to constitute that foundation?

Dr. SPALDING: Dentistry and medicine have some things in common, it is true.

Dr. COOK: And if so, I would like to ask where the difference between dental education and medical education begins; where the special training begins?

Dr. SPALDING: The idea is that those branches that are common to both and that are taught in both dental and medical schools are, or should be, taught equally well in either. But they are taught and studied with reference to the future occupation of the pupil. Take chemistry as an example. The drift of instruction and study in dental chemistry is quite a different thing from that which is pursued when medicine is to be practiced, and so of the rest. Our students cannot master any of the sciences, and hence the knowledge they acquire of each should be that which will best serve them in the profession they have chosen. Dental schools teach the medical and other sciences with reference to dental practice; while medical schools shape their courses with reference to the practice of medicine. If all can be learned, very well; but if not all, then the things that are most essential.

Dr. ALLPORT: Great stress has been laid upon preliminary education. Of course, a preliminary education is essential to the study of medicine or dentistry, but what is more preliminary to the study of dentistry than a medical education. One thing more. I want to ask these gentlemen who cast slurs upon a medical education as being of no consequence, what would they have done without the medical profession in the first place? They say it is only an ornament, but as a profession we have few text-books.

Dr. ATKINSON: Thank God.

Dr. ALLPORT: What we have are from the medical profession. If they are not the best, where are they? Who has ever written one but a medical man?

Dr. ATKINSON: A dentist exclusively.

Dr. ALLPORT: Professional or scientific, they do not exist to-day; and the foundation of our practice is from medical text-books.

Dr. ATKINSON: How about Taft and Richardson?

Dr. ALLPORT: I know to what the gentleman refers. Taft and Richardson are medically educated. But I repeat, if we are going to ignore and cast aside medical books, we have nothing to take their places.

Dr. ATKINSON: We don't want anything to take their places.

Dr. ALLPORT: Then we had better not study at all.

Dr. ATKINSON: That is not it, either.

Dr. ALLPORT: That is a kind of argument that will not answer.

They are the best books we have. They are written by medical men. They may have been written by dentists, but they were medical men, nevertheless. Yet people speak slightingly of medical books and medical education. There is no man to-day who is a scientific dentist who does not depend upon a medical education, whether he calls it by that name or not. Why is Dr. Atkinson what he is? We all know what *he* is very well, and we respect him most highly for his scientific attainments; we sit with profound attention when he speaks; we are aware that he is skilled in the treatment of oral and surgical diseases, and we are also cognizant that the basis of his special knowledge is founded in the science of medicine, procured from medical text-books; and without this medical education he would not have become the Dr. Atkinson he is to-day.

Dr. ABBOTT: I have no doubt, from the remarks I have heard, that the gentlemen all think about the same. It strikes me very forcibly, however, that what are termed medical works are not, as a general thing, used in dental schools. What are used in dental colleges are scientific books, that no medical or dental college can possibly get along without and teach what it should. The foundation of all our education, so far as our profession is concerned, is anatomy. Without our knowledge of anatomy we would make very ordinary dental surgeons.

Dr. SPALDING: There was no anatomy until there was operative anatomy.

Dr. ABBOTT: That is true. I should call it surgical anatomy. That is the kind of anatomy we have to rely upon. Then comes physiology. The dentist cannot get along intelligently without understanding that. That is not medical. Works on physiology are not medical works; they are simply scientific works. Then we want some pathology, some chemistry. Those are the foundation-stones of our specialty, and they are scientific. Now, when we come to the general practice of medicine, we have works upon the treatment of all diseases to which flesh is heir. These are strictly medical works. Then, in our own science of operative dentistry, we have all the works pertaining to that, for our special benefit. There is one thing certain, however: no man, whoever he may be or where he may come from, can get too much education. So the more we ask of a young man, the better will that young man be qualified to carry out his life-work. That is the reason why we commend this association of dental faculties for the steps which it has taken. I certainly feel that the steps have been great ones

in advance, and that thereby we are put in a position to respect ourselves and to make others respect us.

Dr. RHEIN: There is no question that the books treating of anatomy, physiology, chemistry, and materia medica are scientific works, but if they are not also medical, I would like to know what are medical works. They really comprise all there is of medicine, and medical education begins and ends with these.

Dr. ATKINSON: I have personally been called out, and my personal history has been referred to in this discussion. I want to eliminate all that, and to call to your minds the morality that lies in this question, which has been ignored by every speaker. They have not touched the real gist of the matter at all. Every example that has been given here of medically educated men being better dentists for the reason of their medical education, is a subterfuge and a falsity. A dentist is not a regular medical man by reason of his M.D., but by reason of the knowledge that he got aside from his efforts to get the M.D.

Dr. ROBINSON: Afterwards.

Dr. ATKINSON: It has been said that I am only a medical man because I was educated as a medical man. A man is not a medical man until he has learned from actual experience in the hospital and in actual practice. The mere title don't mean anything.

Speaking of text-books, it is one of the best things that ever happened to us that we may have no mandatory text-books as a profession. That is where we stand higher than the medical profession.

Speaking of education, you have probably heard me say, *ad nauseam*, that, if I had my way, I should first give a student a classical education; then I should put him through the best medical course to be had; and then I should matriculate him in the dental college; and before he finished there I should see that he was a good operator. We do not want in our profession men who are merely "tooth-carpenters." The moral deficiency in the minds of such men is the thing we want to emphasize and push out. We want the moral responsibility to rest upon them, so that they shall know for themselves that they are right.

That is not all. Some one has said that if we would win respect we must be self-respecting. Yet some of the greatest fools I ever saw have respected themselves the most. The men who are the least educated assume the most. Those who are disposed to be the most exclusive are sometimes the greatest ignoramuses. Those men

who are determined to keep the boys away from the means of acquiring real knowledge are the very men who have false degrees. They think this fuss and feathers that has been spoken of is an ornament. God save the mark! I want no such ornaments. I would rather stand disenthralled and naked before heaven and earth, with nothing but my skin on, right side out, than have such an ornament as that.

It is the patient, careful observer who is illuminated by the truth in nature that he records and tells to some brother, and they, by association, bring all their different contributions together. If we would do that and give our true perceptions of the righteousness of the matter, knowing what we were talking about, and not going off half-cocked at the first blush of the aspect of truth that always comes hind end foremost to us, we would be men; we would be as a light set upon a hill, that no man can hide or ignore!

What is the source of our education to-day? Where do we get the Shekinah that has so beautifully illuminated our heads and hearts here? Did we get it from the text-books? What is medicine? It is nothing until you have sin. Medicine is nothing but the correction of a perverted activity. God knows how earnestly I have desired to apprehend the conditions of cases, that I might be of use and be made the savior of those who were suffering from maladministration of an assumed knowledge that the individuals who had given the poisons which had worked the mischief did not possess. Let us begin anew in this matter of education. Why when we have the means of illumination should we not begin *de novo?* What is education? It is not stuffing a man with the grace of God, and driving it into him, whether he will take it or not. It is the calling out, by the grace of the Creator, of the possibilities in each individual. Education—*e duco*—"I lead out!" Who is the "I?" It is the leading of the great I AM, who is the FATHER of us all, in whose munificent radiancy we live and move and have our being, mentally and physically. As I said, medication is the correction of a perverted current. They call this a pathological condition. I wish to God we could get rid of these hindrances in the way which have been artificially set up. Pathology is only deranged physiology. It must have been the inspiration of a swamp angel that suggested some of the things that we have in our system of dealing with ideas and processes. I want you to understand, when you are studying anatomy, that you are only studying second-hand physiology. Physiology is before anatomy, as type is before body and as faith is before

all practice. Faith is the "substance of things hoped for; the evidence of things not seen." That is exactly what we want to get now. We want to break down the middle wall of partition, get our Shekinah, and do what we do according to our sense of righteousness, so that what we do shall be without rebuke to our own consciences. If we do that, we need not fear the sayings of Mrs. Grundy. We want to hold the truth in righteousness. What was the damnation of the old school? It was that they tried to hold the truth in unrighteousness. Let us not waste time quarreling over text-books. Louis Agassiz was a man sent from God to this world—to these United States of America. When he was asked, "What text-books shall I have?" he told his questioner to take a scalpel and a fishing-net, go and catch something, and study the text-books of Madame Nature. Now, let us do that. Let us just ignore all this dead-weight that we have so long carried in sueing for recognition by the medical profession.

If I have stated aught which is error, if I have stated anything that is foolish, unloving, unkind, anything that the highest morality of any of you can reject, then ask me any questions you please.

Dr. FRIEDRICHS: I want to ask Dr. Atkinson only one question. He is evidently terribly opposed to text-books. Yet text-books are only the truths which men discover, written down. The truth is eternal; and when it is discovered, some one is going to put it in a text-book. Dr. Atkinson is himself writing a text-book. How can he oppose them so when he is writing one?

Dr. ATKINSON: Simply for this reason. When I studied embryology, I found that there was a thing called a placenta, that for the time being was of vast importance to the fœtus. But when the time came, through the evolution of the organism by the action of the functioning power, that the fœtus was to receive its radiancy or energy by which it lives and moves through another apparatus,—namely, through the lungs,—then the child, at birth, sheds the placenta. Now, when he does that, for God's sake don't keep it on him. My objection to text-books is that they bear that relation to us in our onward progress in science. They are embryonal, and we have outgrown them. That is my reason.

SECTION III.

DENTAL LITERATURE AND NOMENCLATURE.

Report on Dental Literature.

BY J. TAFT, CHAIRMAN.

EVERY material art and every important branch of human occupation has its literature; and in the stage to which the world has now arrived none who desire to keep pace with the progress of the age can afford to ignore it. Letters have come to be an important agency in the development and growth of the arts, sciences, and industries everywhere. They serve to convey thought from one person to another, from one place to another, from one time to another, from one generation to another, from one age to another. Even the more simple mechanical industries have each their separate literature; thus manifesting the power of letters and the importance and value of their right use. The question before us now is, to what purpose has the profession which we here represent to-day used this instrumentality, more particularly during the past two years. Almost every year during the last decade there has been somewhat of a report upon this subject. Section III. will, however, only endeavor now to glean from the growth of the last two years. In attempting a report of this kind, it is not possible to make one that will meet the approval of all. It is not possible to write a book, or issue a periodical, or even prepare a monograph that will not receive criticism and objections. This is to be expected when there is such diversity of apprehension and capacity in the readers of our books, journals, etc. For the last two years there is much ground for encouragement. Observation leads to the conclusion that much of solid scientific work has been done, and permanent record made of it. Perhaps in no similar period during the last fifty years has there been so much accomplished in this direction. The Section is fully of the opinion that

our literature fails to receive much that ought to be recorded. It is probably within the knowledge of every member of this body that facts, principles, theories, and incidents of much value never see the light through the medium of a written or printed page. There are various reasons for this. Some—yes, many—excuse themselves for supposed or real want of ability to write; a few attach very little importance to their own productions; others fear to run the gauntlet of criticism that is sometimes used with undue freedom and too often with unreasonable severity. How often is the statement made that the larger part of our literature is trash, and not entitled to any special consideration. Indeed, it has been said, "far better that all the books we have were destroyed, and that we should begin anew." Such criticism certainly is not calculated to increase the number of those who would add to our literature.

In calling attention to the work that has been done on behalf of our profession for the past two years, the attempt will not be made to occupy all the ground, nor to include all that has been done. The province of such a report as it is practicable to make here is not to select that which the Section thinks most valuable, or of any importance, and present that and that only for attention and consideration, thereby intimating that that which is not in the report is worthless. No committee that could be selected would be competent for such a task as this.

In regard to our periodicals, they continue, with some modification and changes, in much the same channel as heretofore. The leading ones have exercised more care both as to matter and the manner of presenting it. A question in reference to our journals that is worthy of some consideration is that of specializing their work. Hitherto they have each attempted to cover all the fields of our science, art, and education, and whatever in any way relates to the profession. Once it was quite sufficient to embrace every branch or particular in one volume, as for instance, Fitch's "Dental Surgery," and the earlier editions of Harris's "Principles and Practice of Dental Surgery." Now, the expansion and more thorough cultivation of each particular division gives rise to the demand for a volume for each, and so we have Dental Anatomy, Dental Pathology, Dental Materia Medica, Therapeutics, Operative Dentistry, Oral Surgery, etc., etc. Every one recognizes this as the natural and necessary outcome of the progress that has been made as time passed on. It is true, perhaps, that our periodicals could not, for a time at least, be specialized as our book literature has been. Still it is practicable

to do something in this direction. In the medical profession the periodical literature has, during the last ten years been more and more specialized; for example, there are surgical, pathological, ophthalmological, obstetrical, and therapeutical journals, etc. Two years ago the American Medical Association established a journal that should be its exponent and medium of communication. The *Journal of the British Dental Association* is a periodical devoted in the main to the interests of the association whose name it bears.

These facts show the trend of the minds of some, at least, on this subject, and there are indications that still further division of the subjects in the way of journalism will be brought forth in the near future. A question which may be properly considered here is, to what extent and in what way is the specializing of our periodical literature practicable or desirable? It may not be easy to promptly and fully answer this question. It would seem practicable to have one or even two journals in this country devoted to the interests of association work—dental societies; one or more to the subject of professional education, including college work; one to oral surgery, operative dentistry, oral deformities; one to prosthetic dentistry, including metallurgy and chemistry; one to dental pathology and therapeutics. Thus far it would seem entirely practicable, and probably a further division would be found desirable in the future. Some benefits and advantages would certainly accrue from such a division of subjects by our journals. It would bring together in one place the matter pertaining to any given subject; it would necessarily render the consideration of each department more thorough and extended than it is now found to be; it would separate the subjects and make each one to stand out prominently and so receive more attention; it would give an individuality to each periodical that it does not now possess; it would make each one take up such particular work as would be more valuable to the profession; it would remove all occasion for objectionable competition: indeed, each one would become an aid or support to every other. The better and more progressive part of the profession would feel it necessary to have a journal for each special or particular branch.

The future of our journalism is one of the important subjects for consideration by the profession. It cannot remain upon a level; it must make progress or it will go backward. The labor of making such a specialization as is here indicated must necessarily in a large measure devolve upon those of our profession engaged in the work, but an expression from the profession at large or its representatives can-

not be without much influence upon those conducting our journals. Though most of the journals have made progress in the last two years, it has not been so marked as to call for any special notice here. We may, however, refer to the fact that about a year ago the *Missouri Dental Journal* ceased, and following it arose the *Archives of Dentistry*. This journal has for its leading editor Dr. C. W. Spalding, of St. Louis, assisted by a corps of able co-editors. It is one of the independent journals, of which there are but three in the country, according to their own claim.

In our textual literature there have been quite a number of new editions issued during '82 and '83. Prominent among these we may mention "A System of Oral Surgery," by Prof. James E. Garretson. This treatise has, from the beginning, been regarded as one of the standard works of our profession upon the subjects which it em braces. Its title gives an indication of its character. It treats mainly of the diseases, surgery, and treatment of the mouth, jaws, face, teeth, and parts about them. This, the third edition, is enlarged, several new chapters having been added on subjects not before included; seventy-five illustrations have been added, and the matter has been in some respects re-arranged, much of it re-written, and some parts condensed and simplified. So much has been done, however, as to make the present volume much larger than the one preceding it. This is a very valuable work to the profession, as it treats fully, and up to the present time, of many subjects that are imperfectly dealt with elsewhere. Indeed, its presentation of the surgical subjects within its scope is more practical and more thorough than that of any work upon general surgery, and on this account it is sought by and is very valuable to the general surgeon. This treatise, perhaps more than any other, forms a connecting link between the dental and medical professions, and has done, and is still doing, more to bring them together than any other work. Dr. Garretson's views, as is well known, differ in some particulars from those of many others in the profession; but in a report of this kind it is not practicable nor desirable to enter into a controversy upon points about which there is such a diversity of opinion. We will only here venture the suggestion that perhaps the work is rather overloaded with a presentation of cases: three or four cases are sometimes given for the illustration of a point which would be established quite as well with one. We would further suggest that if another edition is to contain the present matter with additions, it would be better to make two volumes instead of one as heretofore.

The second edition of "A Manual of Dental Anatomy, Human and Comparative," by Chas. S. Tomes, M.A., F.R.S., made its appearance in 1882. With the first edition of this work the profession is well acquainted; the second contains all the excellences of the first, with a very considerable addition. The matter has been revised and corrected so far as it required it, and some new matter added. The chapter on dental tissues has been for the most part rewritten, and many new illustrations have been inserted. This book does not cover the ground, nor take the scope of that of Owen, but for the student and for him whose studies must necessarily be limited, this is the best work extant upon the comparative anatomy of the teeth, and it should receive the careful attention of every practitioner.

Early in this year a new work appeared from the pen of Professor F. J. S. Gorgas, of the Dental Department of the University of Maryland, entitled "A Manual of Dental Materia Medica and Therapeutics for Practitioners and Students." This is the first work upon this subject, of any considerable pretensions, issued in this country. It is one that has been long needed by the dental profession, as has been evinced by frequent inquiries for such a treatise, and numerous requests that it be prepared. While works on general materia medica are valuable to dental practitioners, they are not of the same service as a special work which presents and describes the agents and materials used in dental practice. Professor Gorgas has enjoyed a training as a student and a teacher that has eminently fitted him for this work. "While he claims the credit of the compilation, he does not claim originality in the sources of derivation, medical properties, and action of the various articles of dental materia medica which are given in the work. His intention has been, not alone to present his own ideas as to the particular application of remedies, but those of well-known and acknowledged authorities as well, and in such a manner as may be of service to the dental student in acquiring a knowledge of this important branch of the profession; hence, nothing has been presented in this work that in the author's opinion is not applicable to dental practice, or that will not be of benefit to the dental student."

A volume on this subject, prepared by Mr. James Stocken, L.D.S., of England, has been before the profession for several years. It has passed through three editions and has served a valuable purpose, but it has often been suggested, recently, at least, that a work of still wider range was demanded, and to this Professor

Gorgas has devoted himself for some years past. This treatise will doubtless in future editions receive changes, improvements, and additions. One seeking points for criticism may in this, as well as in every new work, find points upon which to dwell. No work perhaps has ever been written that is altogether above criticism. There may be important things omitted from this, but it occupies as wide a range, and covers the ground as fully, all things considered, as could be expected in a new work. It will be of great value to every dental practitioner, and especially to the dental student. Its points of excellence can be best understood by a thorough perusal. The points open to criticism need not be mentioned here, as there seem to be no radical errors with reference to which caution should be excited. The omission to mention and fully discuss some remedies of recent introduction but not yet fully established in use is a matter for which the work should not be hastily condemned. The volume is one certainly worthy of the attention of every practitioner who would keep up with the literature of his profession.

We have in this report only noticed three or four works issued during the last year that seemed to call for some note. There are a number of others equally worthy of notice, perhaps, to which reference may be made in future reports, but of which time now forbids mention.

DISCUSSION.

Prof. MAYR: During the last few years, I have been receiving dental journals from probably all countries where any such are published; and I think some of the gentlemen present would be glad to hear what they are like.

I receive two journals published in France, and you would be amazed at the small amount of original French intellectual food that is offered to the French dentists. Nine-tenths of all the matter in those journals consists of translations from American journals. I don't think I have found one single original article of any value in the last two numbers of the French journals.

The big empire of Austria, with its 39,000,000 of inhabitants, has not one single dental journal. I have not been able to get hold of an Italian journal. I received one journal from Valencia, Spain, published "with the approbation of the Bishop." The journal consisted of eight pages and contained a report, approved by the bishop, about a meeting that had been held, and a clinic of little value, and

something very rudimentary concerning dentistry. That was all it contained. There are some journals published in Cuba, and the other day I received one that was a real live journal. It was as good as many American journals, and contained very readable articles. Concerning the German journals, I said two years ago that they were not very progressive. I was badly pitched into in Germany for that, although I think I was correct then. Since that time, it seems to me that they have immensely improved. They have quarterlies containing reports of societies; and they also contain a large number of original articles. They are very voluminous, but the price is within the reach of almost anyone. There are two English journals which I receive here. One of them reports the dinners eaten by the dentists of England. The other is quite interesting, and contains scientific food. I have also received a specimen copy of a Russian journal. The specimen copy was promising. I made it out with much consultation of the dictionary and hard labor. I found it to contain nothing of special interest, mostly legal squabbles.

Dr. TAFT: There are three journals in England.

Dr. FRIEDRICHS: I think the speaker slandered the French journals when he said they contained no original articles.

Prof. MAYR: *Scarcely* any!

SECTION IV.

OPERATIVE DENTISTRY.

REPORT BY EDWIN T. DARBY, CHAIRMAN.

SECTION IV., in making its annual report, has no papers to present for the consideration of the Association. The year just passed has not been celebrated for the advent of new theories, nor have we been startled by new discoveries. It is true that the inventive minds in the profession have developed some new devices or modes of practice, which may or may not be valuable additions to those already in use.

There are one or two at least which it may not be unprofitable for this Association to consider. First, the new methods of packing or consolidating gold in the cavities of teeth as recommended by by Herbst, of Germany. Perhaps many of you are familiar with his method. He professes to introduce and consolidate gold by means of revolving smooth instruments with far greater rapidity than can be done by other methods, and with less pain and inconvenience to the patient.

The following letter has been forwarded to me to be read in this connection:

"NEW YORK, May 7, 1884.

"MY DEAR DR. REHWINKEL:

"With this mail you will receive some filled teeth sent to me from Bremen by Dr. Herbst, who requested me to send them to you. I have exhibited them to all societies in this vicinity, else I should have sent them to you before this. Please show them before the American Dental Association at Saratoga, where you may split the teeth filled with gold and examine the walls of the same; but I would like to have them sent back to me in the fall, as I would like to examine the walls with the microscope. The external appearance of the fillings is first-class, and I believe this method for certain cases has a great future.

"I remain, as ever, very truly yours,

"C. F. W. BÖDECKER."

The electric or incandescent lamp and its uses in dental practice is another subject which the Association may find profit in considering.

The combination of gold with other and baser metals is not new in theory or practice, yet an expression of opinion as to its advantages, if any, may not be a waste of time.

Another theory, which has received a good deal of attention in one of our State societies may not be unprofitably considered here: the danger of excessive dryness and consequent contraction of dentine and enamel, where rubber-dam and hot-air syringe are used. The theory is that as soon as the tooth becomes wet again there is an expansion of the tissues.

DISCUSSION.

Dr. ATKINSON: I have an excerpt here from a letter received from our esteemed brother, C. F. W. Bödecker, in which he says, "I have seen Herbst, and from him learned a great deal of his method, which is really the most valuable invention that has ever been made in Europe or America, but the profession in this country are ignorant of the fact.

"I shall, when I return, bring with me a collection of teeth, about one hundred, filled by Herbst, which demonstrate the applicability of his method. At the next clinic of our district society I shall demonstrate his method in and out of the mouth. The most difficult cavities in this way are the easiest, and can be made absolutely perfect in a quarter of the time required by any of the other methods. Please announce the fact to the profession, so that we will have a full attendance at the next clinic.

"I have been with Herbst all the week, working like a beaver, and know what I am talking about; for what I have stated is no exaggeration, and when I see you and show you the principle you will approve it and adopt it."

Dr. ABBOTT: I would state that I have seen the teeth referred to, and they certainly have the appearance of being very perfectly and very nicely filled. The process, as I understand it, is to use an instrument that has a little bulb upon the end, for the introduction of the gold, of a size in accordance with the size of the cavity to be filled. The gold is introduced, and this instrument, being run with the engine and whirling rapidly, is pressed against the gold. The explanation is that it condenses the gold sufficiently, and makes

the filling in the way described. I saw one tooth broken apart, showing the cavity on one side and the filling on the other. The filling fitted the cavity very perfectly. Whether they were finished in that way in the mouth is a question that naturally arises. I understand Dr. Bödecker's statement to be that they were filled in the mouth just in that way. As to the advisability of filling teeth by this method, I would hardly even offer a suggestion. I should rather doubt the probability of my being able to do it. Still, one never knows what he can do until he tries. The instruments are very highly polished. I have for a great many years used an instrument, a burnisher that was made in the shape of a tomato, for the purpose of condensing the last pieces of gold upon the surfaces of the fillings. I use that almost constantly in large cavities. It condenses the gold more thoroughly than it can be done by hand or with the ordinary plugger.

Dr. R. FINLEY HUNT: I would like to ask whether this method of filling is intended for cohesive or non-cohesive gold.

Dr. ABBOTT: My impression is that the gold used was cohesive. I would not state positively, but that is my impression. I don't know what thickness it was, or anything about it.

Dr. DABOLL: Dr. Miller, when in Buffalo, stated that at Dr. Herbst's request he filled several teeth himself, in Herbst's office. The gold used is soft. Dr. Miller also stated that in Germany they prepare a gold that is as soft as anything we have, if not more so.

Dr. FRIEDRICHS: You mean cohesive gold?

Dr. DABOLL: Not cohesive gold at all; non-cohesive gold. The contour cavities are filled by the aid of a matrix that is made of a thin substance and held in position by the use of shellac. He introduces the gold in large masses, and does that uniformly, if the cavity is large. He proceeds without retaining-points, or anything of that kind, and works rapidly,—so rapidly that Dr. Miller said he filled a large cavity in ten minutes. He said that, as nearly as he could judge in the short time that he had, and with the tests that he could give, he thought the cavity was filled quite as well as by any other method, and was entirely moisture-proof. He also said that he tested it with aniline, and thought there was very little leakage, if any. He said he was unable to observe any in several specimens which the doctor had given him. While he was not prepared to indorse the system, he said that it was certainly ahead of anything he had ever seen for the rapidity with which teeth could be filled.

Dr. STOCKTON: We have a gentleman from New Jersey here, Dr. Timme, who has had considerable experience in this line.

Dr. WATKINS: Dr. Timme has stepped out and will not be back this evening. I will say, in his absence, that when he was in Germany he was very much interested in this method. He used a set of instruments, such as they use there, which are burnishers of different shapes, mostly running to small points. They are cone-shaped, and are to be run in the engine. The gold used was that prepared in Germany, and imported by himself. This gold is similar to that made by Mr. Williams, which he terms electric gold. In January, Dr. Timme gave a clinic at which he filled a large cavity in a lower molar, using the revolving instruments from beginning to end of the operation. To all appearances the filling was well condensed and put in as nicely as it could be put in by any other method; and it was perhaps put in more quickly than it could have been with other instruments. The doctor claimed that he was not an expert at all, and had had very little experience in that mode of operating. However, when it was completed, it was a very nice filling. Last February Dr. Bödecker filled a tooth for me, using the Bonwill mallet for the principal part of the operation. About the last sixth of the filling he put in with a bloodstone burnisher, and the latter part of the operation seemed just lovely in comparison with that in which he used the mallet. It did not seem to cause any strain at all on the tooth, and it has the appearance of being perfectly condensed, just as much so as it could be, I think, with any mallet. I have tried this method on a small scale myself, in the way of burnishing gold down with an agate burnisher. I frequently, where I have been working upon a large cavity, after getting the cavity a half or two-thirds filled, use a strip of gold about No. 30, or No. 4 folded to about thirty-two, well annealed. This I lay on the surface and burnish down. I think you would be surprised to see how dense that gold becomes with but little pressure, and also how strongly it coheres. You will also find the agate burnisher a nicer instrument for burnishing the surface of fillings than one of steel. The agate does not seem to break the edges of the cavity as steel would when it comes in contact with them.

Dr. BARRETT: I have had only a limited experience with this method, but there are some things that I can say about it. The gold used is the most non-cohesive that I have ever seen. I have not succeeded very well with the gold that we get here. This method, like any other, requires considerable practice before one can acquire

the expertness of manipulation which enables him to succeed; but I have experimented enough to satisfy myself that with the proper kind of gold, especially with the Wölrab gold, you can burnish it down until it seems as though it was as perfectly united as you could conceive cohesive gold to unite. The instruments that are used, as far as I have seen them, and I have used some that came directly from Dr. Herbst, are smooth, but not particularly polished, and have extremely small points. They may become plated with gold in using, and it is Herbst's practice to keep upon the operating-table, by the side of his gold, a piece of block tin upon which to remove the plating of gold which is formed upon the surfaces of the instruments. The gold used is in the shape of cylinders, and the cylinders, I believe, as Herbst prepares them, are of different sizes.

Dr. A. O. HUNT: Immediately following the publication of the translation describing the Herbst method of filling teeth, I also procured a set of instruments and made some experiments with this method out of the mouth.

The difficulties to be encountered are many. Still, they lessen when one understands the principle and uses the proper instruments and gold. The first trouble I experienced was in the use of the large cylinders or pellets of gold for starting the filling. It has been my custom to use smaller ones, or ribbons, so that when I came to double or treble the amount it was very difficult for me to manipulate it. But I could not in any other way succeed in keeping the gold under the burnisher or plugger. After curling up and wabbling about for awhile it will finally find a lodgment. As soon as this is accomplished it is very much like working gold by present methods; but there is a tendency to ball up or form little hummocks.

To give you an idea, as nearly as I can, of what the condition of the instrument ought to be,—those I have are made like a burnisher with a highly polished surface. They readily plate with gold and while thus coated do not give good results. To remove it I used the best material I had at hand, which was fine emery cloth, perhaps finer than 00. By rotating the instrument over this, all the accumulation of gold is taken off, and then when the instrument is used on the filling it works very well. Dr. Barrett speaks of block tin. I did not know that Dr. Herbst used that. Dr. Abbott refers to the use of the corrugated burnisher as a final condenser, as in other methods. In the published articles it is stated that this burnisher or plugger is not held continuously on the gold, but

used with a rapidly interrupted motion. When the burnisher is running as rapidly as it can be run, with an interrupted motion of your hand you get better results, which answer to the principle of a corrugated burnisher striking on the gold as it rotates. I have made experiments with various forms of gold, all of them soft, as I understand it should be. I have used the fine No. 4 grade of White's, Williams's, and Valleau's manufacture. I see no particular difference in them, except that the "1000 Fine" works a little easier and does not quite so readily form the hummocks which have been mentioned. After the foundation of the filling is firm it is not a difficult matter to build up the foil, using a small quantity each time and running the engine rapidly. A larger quantity must be used in the beginning in putting the gold into the cavity; the difficulty of securing the first portion of gold is very annoying until you get accustomed to it. It requires a peculiar knack. So far as the matrices are concerned, I do not see that it is absolutely necessary that they should be used, but it is very much more convenient to use them. You can contour a filling without a matrix, but of course you will readily understand that with your instrument rotating very rapidly, the danger of its dodging from right to left and up and down is considerable. I tested the cohesive property of the fillings by various experiments,—breaking away the walls of the tooth, and then with a chisel pressing the gold in the opposite direction from which it was impacted. I then with a sharp chisel cut across what would be the lamination of the gold, and I found in the teeth I filled —after the first few—that each time I succeeded in getting a better cohesion, and I am satisfied that, if we could have a thorough demonstration of this method by experts, many could use it to advantage. That there are merits in this method I am thoroughly convinced.

Dr. CROUSE: Why is a rapid motion better than a slow one? Does it heat the gold enough to make it cohesive?

Dr. HUNT: No, sir, I should judge not. If it should do that, it would cause an unfortunate condition of things in the tooth. You will remember that I said I did not hold the instrument continuously on the foil, but used it with an interrupted motion to avoid the heat which would be caused by friction. Pure gold, if the surface is clean, will cohere by pressure alone.

Dr. CROUSE: It has been suggested to me that the gold was annealed by the rapid motion.

Dr. ALLPORT: I see just fascination and good enough in this method to create a desire to adopt it, and I see just evil enough in it to make a great deal of trouble, if it is generally adopted in our practice. When plastic gold came into use, nearly everybody went crazy after it. I was appointed one of a committee to investigate its merits and report to the Association. As perhaps some of you will remember, that report did not encourage its use. Some of my friends were very much inclined to the use of it. I remarked to them, "The less of it you use the better dentists you will be considered five years hence." I can foresee that many will be inclined to adopt this method, and I feel that unless we do something to counteract it, a great deal of mischief will be done, and I wish to raise my voice against it. The trouble is not going to be with the packing and welding of the gold in easily accessible cavities, but in general practice it will be impossible to so adapt the plug to the walls of the cavity that leakage will be prevented. In every specimen tested by Dr. Bödecker, he said he discovered a slight leak. I believe you can never get over that difficulty. The principle involved is wrong, and although in a few cases saving fillings may be made by this method, in general practice it will prove a failure, and the less encouragement we give it the better.

Dr. BARKER: If the gentlemen who have experimented with this method are correct, there is certainly a new principle involved in it. If with a burnisher you can pack non-cohesive gold so that it will cohere, or, in other words, make an absolutely homogeneous filling, then I have learned something new. If that is true, it will not be necessary to anneal foil in order to make it cohesive. It matters not, as I understand it, if the method is based on sound principles, whether we use the burnisher by hand, or in rapid rotation with the engine, the effect produced in the one case will be the same as in the other.

Now, I do not call in question the statement of any gentleman on the floor; but in order to be convinced that an absolutely homogeneous filling can be made by this method, I shall require to see it done. I certainly agree with the gentleman last upon the floor, that the general use of this method would probably be very unsafe.

Dr. CLARK: Some time last winter I listened to a paper upon this subject, read by Dr. Fillebrown, of Boston, and determined to try the method. I procured the gold that was recommended in the paper, and my experiments resulted in some bad failures. Then I did what ought to have been done in the first instance,—thought the

matter over seriously, and found that this method was similar to one in use thirty or forty years ago; that history was but repeating itself. I then referred back to a great many fillings that I had put in at that time with round, blunt points. They were considered good fillings then, and I often wonder how I put them in. I don't believe I could do it now. I think this practice is pretty nearly a revival of that. At the time I refer to, the manufacturers made a soft, velvety foil that we cannot get now, as I found in my recent experiments that the best soft foil that can now be had is not equal to that formerly used. I fully agree with what Dr. Allport has stated, and believe this thing will be productive of a great deal of harm unless we confine ourselves to a certain class of cavities, which can be filled very easily with almost any gold. I object seriously to using cohesive gold in body-fillings, because I am very fearful of pits made by our serrated instruments. I believe these instruments cause more leakage than we are aware of, and more than we are apt to create with round points. I believe very few of our first-class fillings, put in with cohesive gold, will bear microscopic investigation. We did not attempt to build out teeth forty years ago; but many of you can remember the smooth, wedge-shaped instruments for use between the teeth, in filling cavities of a certain kind. Some very good fillings were made in that way; and the same principle was followed then that I think is recommended now.

Dr. RHEIN: I was present when Dr. Bödecker filled the tooth for Dr. Watkins which has been mentioned. I think the bloodstone burnisher is better for burnishing in gold than the Herbst instruments. Most of those who saw the operation were of the opinion that the friction of the instrument upon the filling-material caused the gold to anneal; it certainly made heat enough, and thus caused the gold to become a homogeneous mass, and Dr. Bödecker was of that opinion at the time. One point that is important is in regard to using this method in a cavity in the neighborhood of the pulp. I should think it would be painful. Dr. Watkins said that he felt nothing at the time of the operation, but this might be explained by the fact that the filling was nearly completed before this method was tried.

Dr. WATKINS: I rose to my feet before Dr. Rhein began to talk with the intention of saying that the gold used by Dr. Bödecker was Kearsing's gold, and that each piece was annealed.

SECTION V.

ANATOMY, HISTOLOGY, AND MICROSCOPY.

On Certain Disputed Points in the Development and Histology of the Teeth.

PAPER BY J. L. WILLIAMS, OF THE SECTION.

MR. President and Gentlemen of the American Dental Association: The one thought which has been uppermost in my mind since the chairman of Section V. invited me to read a paper at this time has been in the form of a query, whether there would really be sufficient interest in this subject, on the part of the Association, to warrant my occupying the necessary time to present the theme. Perhaps I ought not to have been troubled with such misgivings, but while it affords me a genuine pleasure to present to the profession the results of my labors in this direction, yet I think those matters which have a direct relation to the details of our daily office practice have a more decided interest for the most of us, and I have no desire to force myself upon an unwilling audience. I must conclude, however, that if the dental profession desires to know anything concerning this subject, it desires to know the truth; and the fact that I have been charged by those holding high positions as teachers with theorizing somewhat upon these matters and making statements which are not supported by facts is, in itself, perhaps, sufficient reason for my desire to present such evidence as I have in support of my position before the representative dental organization of the world. I shall therefore take up only such points in the history of the development of the teeth as are in dispute at the present time.

It would seem hardly necessary for me to disclaim any feeling of animosity or antagonism for the sake of disputation alone. I suppose I possess a certain amount of that intellectual pride which is common to humanity, and from which springs the gratification arising from the belief that the opinions which we hold are correct,

yet I am certain that I would trample such pride in the dust instantly if I saw that it stood in the way of my acceptance of the truth. I must assume that my highly-esteemed friend, Prof. J. E. Garretson, and others who have criticised my views are equally desirous with myself of knowing the truth; and while I suppose their belief in the certainty and security of their position has been productive of a feeling of magnanimous commiseration on their part for me, yet, if I have not completely lost all ability to interpret facts and perceive truth, I shall to-night present such evidence of the correctness of what I have previously said upon this subject as shall place my position beyond all possibility of disproof or doubt.

This subject is one which must depend largely upon illustration for its intelligent presentation. This being true, there appears the possibility of the imagination of the artist entering as an important factor in the work of illustration. This becomes especially important when there is great difficulty in tracing the continuity and relation of tissues. We have a striking example of this in Dr. Abbott's chart representing a section of a central incisor with its surrounding tissues. In this chart the odontoblasts are represented as round or oval plastids or cells, between which the dentinal fibrillæ pass to a connection with non-medullated nerve-fibres,—an error which has arisen from the extreme difficulty of preparing specimens in which the continuity of the tissues can be traced. This led me to look for an artist in whose illustrations there should be an absence of all sentiment and imagination, who should be no respecter of persons, and the truthfulness of whose work no one should dare question. In the pure sunlight of heaven, whose swift pencils wrought many of the illustrations which I shall present to-night in a space of time not exceeding the interval between the diastole and systole of a human heart, I found the agent to do my work. While the possibilities of photography are limited, within that limit there is nothing but the truth pure and simple. The photo-micrographs presented to-night were all made from actual sections cut from the jaws of human and animal embryos. The sections from which the photographs were made will be placed under the microscope for your examination after the reading of the paper. I invite the most critical examination of these slides, knowing that the more critically they are examined the clearer will appear the elucidation attempted upon the screen. In fact, I desire to depend upon what shall appear upon the screen only so far as is necessary to make plain what can really be seen under the microscope. I must add just a few words

about the quality of the photo-micrographs. They were made without either a heliostat, substage, or a bull's-eye condenser, all of which accessories I should have had, but could not procure them in time for the work. They are not, therefore, quite as sharp and brilliant as I could wish, but perhaps sharp enough to prick some of the imaginative and "philosophical" bubbles of my critics. I have here on the desk before me a reprint from the *Dental Practitioner*. The title of the paper is "Development of Enamel Similar to other Epidermoid Structures." The paper presents a ludicrous and also a sad aspect. Ludicrous, in that the accidents due to a lack of skill on the part of the gentleman who mounted the specimen from which the drawings were taken are made to do duty as an explanation of a preconceived hypothesis which never had any foundation in fact. Sad, in that so little is really known concerning the histo-genesis of the teeth; that it is possible for a man to present such a paper as this to the profession without ruining his reputation as a histologist; and more lamentable still is it to find this dignified nonsense indorsed by the president of the Philadelphia Clinical Society, "an expert pathological and histological microscopist, and a gentleman whose learning and scientific attainments will not be questioned," says the author of the paper; all of which may be true as applied to the gentleman in his legitimate sphere, but the little that appears in this paper contains evidence that his opinion concerning the formation of enamel is of no value whatever.

During the discussion following the paper which I read before the New England Dental Society, at Providence, last October, it was privately remarked that it really was a matter of little importance whether this theory or that of the development of the teeth were true. It would probably be entirely out of place for me to discuss that question here. I must believe that gentlemen who travel the length and breadth of a continent to confer with each other concerning what is latest and best in the thought and practice of their chosen profession do regard this subject as one of the important foundations upon which the scientific status of dentistry rests. The man who does not admit this has a very narrow and dwarfed conception of the possibilities of modern dentistry. Do you think Dr. Atkinson would have dared undertake that brilliant operation which has resulted in the union of several fractured teeth, but for his knowledge of the minute structure and functions of the tooth-pulp? Most assuredly not. Under all circumstances, the man who is master of the situation is the one who best understands the nature and

resources of the material which he has in hand. This being admitted, then it is a matter of vast importance that we know who is right and what is true about tooth-structure and development. It is a matter of importance that students should be correctly taught concerning these subjects.

It is the object of this paper to point out four important fallacies which are taught at the present day concerning the development and structure of the teeth. To this end I shall demonstrate that the teeth are not developed as papillæ in a groove; that there is an enamel-pulp or organ which has a definite function; that the formation of enamel is from the line of its union with the dentine outward, and that the odontoblasts are of the nature of ganglionic elements, sending processes outward into the dentine, backward into the substance of the pulp, and probably also laterally connecting them with each other. In answer to the query why these points have not been established before, I can only say that the subject is an exceedingly difficult one to investigate, and, so far as I know, the specimens which are presented for your examination to-night are the first and only ones which have ever been produced showing the natural relations of all the dental tissues to each other and to their surrounding tissues without break in their continuity. It has cost me years of study and experiment and the expenditure of hundreds of dollars to accomplish the work the results of which I am to show you to-night. You will pardon me, therefore, for my disposition not to readily yield what this long course of study has taught me to those who pin their faith to "philosophical" deductions, or a few worthless microscopical specimens sent them by some commercial dealer. The fact that I have already criticised Prof. Garretson's hypothesis of the development of the teeth, and that the author of the paper referred to is chief of the clinical staff of the Hospital of Oral Surgery of Philadelphia, of which Prof. Garretson is the surgeon in charge, leads me to believe that this brochure is in the line of a defense of Prof. Garretson. The photo-micrographs at hand enable me to refute the teaching of Prof. Garretson and others, that the teeth are developed as papillæ in a groove, which is called the "primitive dental groove," in a much more effective manner than I was able to do in my review of his address in the *New England Journal of Dentistry*, and the more recent series of articles in the *Dental Cosmos*. As an evidence that I desire to render full and complete justice to Prof. Garretson and my distinguished opponents, I propose to present photo-micrographs which I think I may safely

claim are equal, if not superior, to any illustrations which have ever been produced in support of their hypothesis. I shall first, then, proceed to show you actual photographs of sections of the jaws of human embryos, which present the "primitive dental groove" of Prof. Garretson and the older writers with diagramatic clearness.

You have on the screen (Plate I., Fig. 1) a photograph from a section cut through the face of a human embryo at about the eighth or ninth week of intra-uterine existence.

Here we have the "primitive dental groove" in which is seen the developing tooth-germ with the so-called "tunica reflexa" about folding over it, leaving the space in which the enamel is developed. Does it not seem to be a perfect illustration of the hypothesis? It may be a "thing of beauty" for the moment to those who have fondly cherished a belief in a "primitive dental groove," but it certainly is not destined to be a "joy forever." The photograph is from one of the first specimens which I prepared, and was mounted several years ago. Every process in its preparation was carefully conducted according to the authority of "the most celebrated and expert slide-makers of Europe," and with what results? Why, all of the delicate superstructure above the so-called "basement membrane," including the enamel-pulp, was destroyed, leaving the appearance as shown. The slide possesses no value whatever. I say no value; but perhaps it may be said to have an historic value, in precisely the sense that the implements of the stone age, while possessing no intrinsic worth, yet have an historical value, as showing the benighted condition the race was once in and the progress which has been made since that time. Let me now call your attention to photo-micrographs taken from specimens mounted after different and better methods.

This view (Plate I., Fig. 2) shows the first observable differentiation which marks the commencement of the process of dentition. In former papers upon this subject I have said that "if an imaginary line be drawn through the cuboidal layer of epithelial cells directly over the position which will be occupied by the future jaws of the embryo, it will represent the first observable indication of the development of the teeth. These cells, in obedience to the law of typal requirement, begin to proliferate and increase rapidly in size. This growth forces the columnar layer downward and the flat layer upward. This upward bulging forms a band running around the entire surface of the jaw, and is the *bourrelet* of Legros and Magitot, while the downward curving of the columnar layer gives, in

transverse section, the V-shaped appearance," as shown in this photograph.

The removal of the delicate embryonal layers of epithelium by the older methods of preparing specimens leaves the "primitive dental groove" as shown in the preceding illustration. From the inside of this band there grows downward or upward, as the case may be, a thin lamina, from the free edge of which arises the epithelial cord, which, penetrating deeper into the substance of the jaw, enlarges at its lower extremity, forming the enamel cap within which is developed the enamel-pulp. I wish to compare this photograph with the illustration which will follow upon the screen, for the purpose of demonstrating that in point of fact and principle I have shown nothing in my drawings which may not be seen in the photographs from the specimens. (Photographs were then shown of illustrations of former papers by the author in the *Dental Cosmos.*) And now, just a few words concerning the enamel-pulp or organ before proceeding to review the paper of which mention has already been made. The existence of this important feature of a developing tooth is denied by Prof. Garretson and others, for the reason, I suppose, that their hypothesis makes it necessary that there should be no enamel-pulp.

Gentlemen, the view on the screen (Plate I., Fig. 3) speaks a hundred times more effectively than any arrangement of words, and forever sets at rest this question of an enamel-pulp. This is a photo-micrograph from a section through the jaw of a human embryo, showing the development of a temporary molar. You will observe that the enamel-pulp is, in accordance with what I said in my review of Prof. Garretson's address at Providence, the largest and most conspicuous feature of the tooth-germ in its earlier stages.

As I shall refer to this subject again, I leave it for the present, while I give a few minutes' attention to the paper to which I have already referred. This reprint is largely composed of quotations from different authorities, with comments upon them as to the manner in which hair, skin, hoofs, and horns are formed; an extract from Legros and Magitot; the views, to the extent of half a page, of the expert microscopist already referred to; a brief comment on one of my drawings taken from the *Dental Cosmos*, and a little more than a half page by the author on the formation of enamel, the subject proper of the paper, and the most of this half page is a description of a drawing made from a slide mounted by Cole, of London.

Assuming that the drawing is a fairly good representation of the slide, it is of but very little value, and the description shows a ludicrous misrepresentation of the little that really can be seen. It is a favorite method with many dialecticians who find a weak cause on their hands to defend, to assume, in a few skillfully arranged sentences, that the hypothesis which they are trying to establish is similar to or identical with, in its relation of principles, some other well demonstrated and generally admitted theory. The most of the time occupied is consumed in dwelling upon the major premise of the argument, which may be nearly or quite self-evident. The mind of the reader or listener is forcibly impressed with the truths presented, and then the minor premise and the inferences or conclusions are rushed in with the flourish of a few well-rounded sentences, and the hearer is overwhelmed before the mind has had time to recover its critical equilibrium sufficiently to see that there are several missing links in the argument. It is a kind of logical trick similar to those with which the Greek school of sophists were wont to amuse themselves. This is quite the case with the paper of which I am speaking. The scheme of argument presented in this paper might be stated as follows: Hair, nails, hoofs, and enamel are epidermoid structures. All epidermoid structures are developed in the same manner. Ergo, the process of the development of hair and enamel is identical. Now, the weak point in the argument arises in the minor premise, which asserts that all epidermoid structures are developed in the same manner, which is very far from the truth. Scales, hair, feathers, nails, horns, hoofs, the enamel of the teeth, the sweat-glands, the sebaceous glands, and the mammary glands are all derivatives of the epidermis, but they are not all developed in the same or even in a similar manner. I have frequently urged the importance of some knowledge of comparative embryology in the study of these formative processes. It is impossible to grasp in a rational manner the significance of the intricate unfoldings in the evolution of the higher forms of animal existence without having studied these processes as expressed in a more simple manner in the lower forms. It would be well for these gentlemen, who discourse in a very general way with such a show of profound learning about my reversing the formative processes, disregarding the general physiological laws, and dragging in a divine interposition, to at least give some little attention to the rudiments of these laws themselves, and ascertain, if possible, what they are talking about. There is something about the expression, "a general physiological law,"

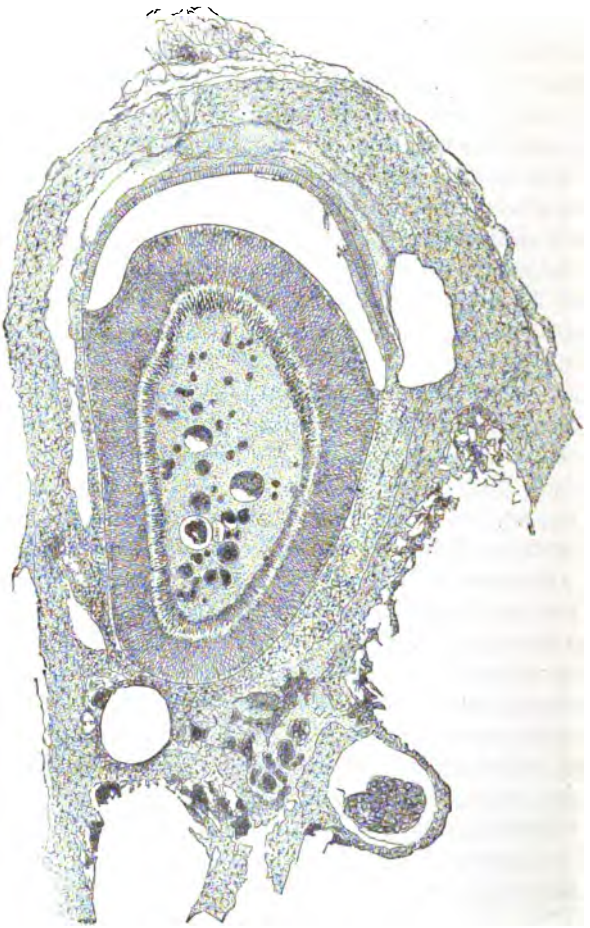
which makes it a delight, to men who have only a scanty definite knowledge of a subject, to roll it as a sweet morsel under the tongue. A vast amount of ignorance has many times concealed itself behind "a general physiological law." A little definite knowledge at critical moments is of vastly more value and importance than volumes of brilliant generalizations, which may mean anything, but generally mean nothing.

The ostensible title of the paper in hand is "The Development of Enamel Similar to other Epidermoid Structures." The author would have succeeded much better if he had stuck close to his text. But on page 6 of his reprint, and also on the tenth page, he emphatically declares that the law governing the formation of hair, nails, the cuticle of the skin, the shell of the turtle family, the hoofs of ungulates, and the horns of most of the ruminants, is precisely the same law which governs the formation of the enamel of the teeth. Now, that is precisely what it is not. How any man of sound mind, with healthy, active reasoning powers, could honestly assume that a tissue which is constantly being thrown off and replaced by new tissue—which, when lost, is replaced by a new growth, as is the case with most of the epidermoid derivatives—can be identical in its process of formation with a tissue which never grows after its typal limit is reached, which is never replaced when lost, is quite beyond my powers of comprehension. I might enter into an elaborate argument to show how utterly impossible it is on *a priori* grounds for the development of enamel to be identical with the formation of hair, but it is much the better way to come straight to the demonstrated facts.

You have on the screen (Fig. 14) a photograph of the drawing in the brochure under consideration, made from the slide mounted by "one of the most celebrated and expert microscopical slide-makers in Europe." It is upon this drawing that he depends for the demonstration of his hypothesis. Now, what are the facts concerning it? It is worse than useless, in the sense that a perversion of truth is worse than the absence of truth. It is misleading to one who has not had experience in the preparation of sections of embryo jaws. It purports to be a section showing the temporary and permanent tooth-germ. The germ of the permanent is entirely absent, as is the enamel, with the exception of a few fragments which were formed on the dentine of the temporary tooth. These portions were probably torn out in the cutting of the section, or washed out in its preparation for mounting. The treatment necessary for the removal

of the water from the tissues previous to mounting in balsam is such that many portions of embryonal and delicate structures are shrunken, distorted, and frequently almost completely destroyed. In this drawing the enamel-pulp, an exceedingly delicate tissue, is so nearly

FIG. 14.



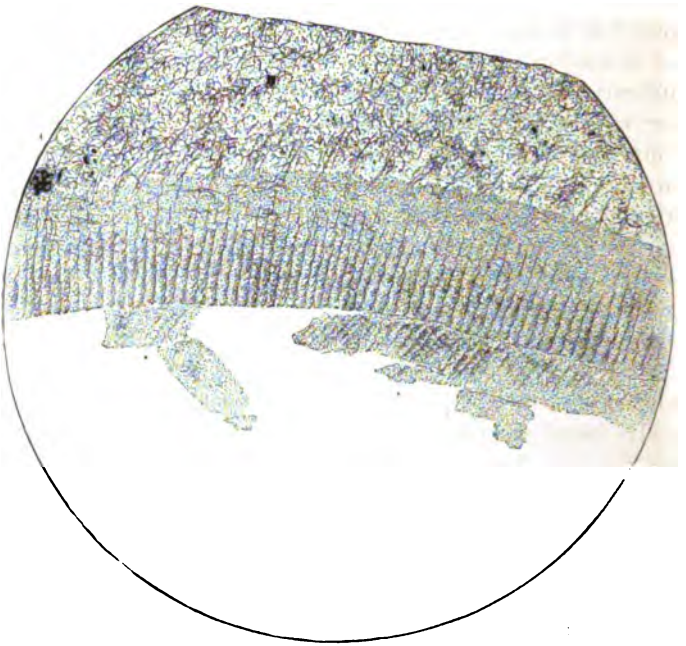
obliterated as to have little or no significance. The author says, in speaking of the space shown between the dentine and enamel, that it appears in my drawing, and that all good sections show it. Is a "good" specimen one in which all of the tissues are shown in an undisturbed relation? If so, then no good section shows such a

space. It is shown in the drawing referred to, because in all of my drawings I have endeavored to faithfully reproduce the specimen from which the drawing was made, and, where there are defects in the specimens, those defects have been reproduced and explained for the benefit of those who are to follow me in this line of investigation. We sometimes learn more from the failures and defects in our work than we do from our successes, if we but keep our minds open to the reception of truth, at the expense even of a little injured pride. I shall show you photographs and microscopical sections to-night in which these dental tissues are in an undisturbed relation, and where, previous to the commencement of the formation of either dentine or enamel, the dentine-pulp and enamel-pulp are in perfect contact, and also specimens where the first faint lines of dentine and enamel have appeared, and these lines of dentine and enamel in perfect contact, with the ameloblasts everywhere plainly shown above the enamel. In all of the sections which I have cut during the past year there is no appearance of a space between the dentine and enamel until the section is placed upon the slide and the cover-glass pressed down. Then the pressure quite frequently forces the tissues slightly apart. The second illustration of tooth-structure in this reprint is represented as a portion of the previous section more highly magnified (Fig. 15). There is no appearance of an enamel-pulp in this drawing, and what is intended to represent completely-formed enamel is really in the position occupied by the ameloblasts. Below these cells there are probably in the original section a few fragments of the broken and torn enamel. This specimen, as I infer from the text, was submitted to the aforementioned expert microscopist, who returned the following comments:

"A microscopic study of the section of embryonic tooth you sent me discloses the existence of a space between the dentine and enamel. At the base of the enamel, *i.e.*, the surface of the enamel-rods next to the dentine, there exists an apparent line or membrane. Below this line or membrane is a somewhat homogeneous or colloid-looking substance, evidently of much less consistence than the structure above. Above this line is the enamel more fully developed and already hardened." After stating that the supposed line or membrane was an optical delusion, due to angular displacement of the softer portions of the enamel, he further says: "The enamel is formed on the dentine, and develops and becomes indurated as it is elevated by the development of new structure below, precisely as in the case of epidermal cells. I believe the teeth to offer no exception

to the general physiological law, and consider the doctrine which teaches that enamel is formed upon the dentine and grows by deposits from above as erroneous as the announcement that a membrane or line exists in the middle of the enamel-rods." Well, shades of Leeuwenhoek protect us! Such a complete misinterpretation of anatomical structure and physiological action can only find a parallel in the ancient doctrine of the "primitive dental groove."

FIG. 15.



After stating that there is a space between the dentine and enamel, in which space no structure of any sort appears, and which, in the developing tooth is a closed cavity surrounded on all sides by solid walls of dentine and enamel, he proceeds to tell us that enamel is formed in that cavity. But how formed, and from what? He says it is formed at the surface of the dentine and pushed upward from below. There is indisputable evidence in the structure of enamel that it is formed from prismatic cells. But there are no cells within this space or closed cavity. It can hardly be possible that the writer did not know that there can be no formation of tissue without proliferation of cells or corpuscles. In the formation of other epi

dermoid structures there is a constant cell proliferation from beneath. But no eye ever beheld the enamel-forming cells, in a section in which the tissues were in their natural relation, below the enamel and between the tissue and the dentine. They are always above it. After quite a lengthy quotation from Dean's translation of Legros and Magitot, the author of this reprint discloses the fact in a single sentence that he has never seen a well-mounted section showing a developed tooth. After referring to the analogy between the lower layer of cells of the enamel-organ and the prismatic cells of the intestines, he says: "It is one more point in favor of my position, that the enamel is not built by deposits from above, but pushed upward by a multiplication of cells from below." It is much to be regretted that he ever made this statement, for it is certainly destined to bring upon him the most intense humiliation.

You have now upon the screen (Plate II., Fig. 11) a photograph of a section of the jaw of a kitten at birth. The section, while representing an advance beyond those in which the "primitive dental groove" was so well portrayed, yet contains imperfections which make it of value in explaining some of the errors into which previous writers upon this subject have fallen. At the lower part of the view and rising upon either side is seen the inferior maxillary bone in transverse section. In the inferior parts of the bone is seen the medullary canal containing the nerves and blood-vessels. You will observe the very large proportionate size of the inferior maxillary nerves as shown in cross-section. Rising immediately above this, and occupying the larger part of the interior of the jaw, is shown the developing temporary tooth, to the side of which is seen the permanent tooth-germ. The cap of dentine is seen surmounting the pulp entire. But the thin line of enamel has been torn from its connection with the dentine and broken into fragments. Fortunately, however, while the space which it bears explains the space in Figs. 14 and 15, yet the structure of fully-formed enamel with the characteristic wavy lines, which nearly always run diagonally across each other at the tips of the cusps, is plainly seen in the lower side of these fragments, while the enamel-forming cells are clearly shown above. But a little further down on the side of the developing tooth the tissues remain in their natural relations, giving a perfect refutation of the hypothesis taught by Prof. Garretson and others. First, we see the tissue of the pulp surrounded by the layer of the odontoblasts; next, the band of formed dentine upon which a thin line of enamel has been deposited. Above this narrow line of

enamel are seen the ameloblasts, and outside of these cells the flat layer forming "Nasmyth's membrane," and further beyond the enamel-pulp. That there may be no shadow of doubt about the position of these enamel-forming cells outside of the formed enamel, I have slightly torn the tissues at this point in several specimens (Plate I., Fig. 5, and Plate II., Fig. 13), so as to show the isolated ameloblasts, the characteristic shapes of which, once seen, will never be forgotten. The next view (Plate I., Fig. 4) is a photograph under high power, taken low down on the left side of Fig. 11 (Plate II.,), where the enamel has just commenced to be formed.

It would not seem as though any further demonstration in support of my views could be asked for. You observe at the lower part of the view the dentine pulp surmounted by the odontoblast layer, above which a line of dentine has been formed, and upon the dentine a very thin layer of enamel has been deposited. Then come the ameloblasts, or enamel-forming cells, in intimate relation with the enamel-organ. We will project several more views upon the screen in further demonstration of this point. These photo-micrographs are from sections of both temporary and permanent teeth (Plate I., Figs. 5–7). Plate I., Fig. 8, is a more highly-magnified view of the lower part of Fig. 11, Plate II. It shows the medullary canal with nerves and blood-vessels. Observe the size of the inferior maxillary nerve and its tripartite division.

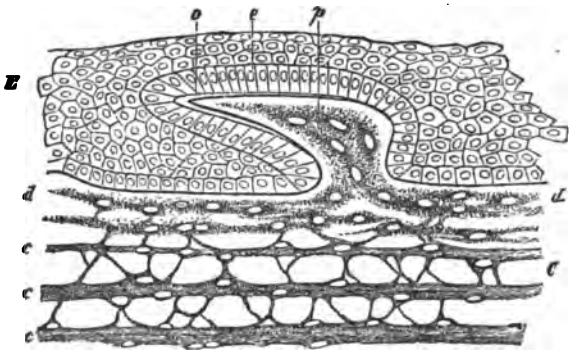
I think the most skeptical of my hearers must now be thoroughly convinced that the development of enamel is from the line of its union with the dentine outwards. Concerning the exact manner in which the formation of the enamel takes place, I cannot speak authoritatively. In every phenomenon of physiological activity there will probably always remain a deeper depth which the human mind cannot penetrate.

The fact, as I have before stated, that there can never be seen but a single layer of enamel-forming cells surmounting the enamel, leads naturally to the inference that amelification occurs by a secretion and deposit from these cells, and that, as the ameloblasts recede before the advancing formation of enamel, the fibre of the enamel-cell, which can plainly be seen projecting from the lower part next to the line of formed enamel, remains as the persistent fibre of living matter which Dr. Bödecker has so ably demonstrated as forming an essential feature in the histology of enamel. It is also possible that the formation of the enamel may be by an intercellular deposit and gradual elongation of the cell upward.

It is not true, as asserted by certain writers, that this method of the formation of enamel finds no parallel in epidermoid structure.

The process of the development of the placoid scales of the Elasmobranchii is almost identical with that by which teeth are formed. I quote from Hertwig and Balfour, than whom there are no better authorities in the world on this subject, who say, in speaking of these placoid scales, "They consist, when fully formed, of a plate bearing a spinous projection. They are constituted of an outer enamel layer on the projecting part, which is developed as a cuticular deposit of the epidermis (or epiblast), and an underlying basis of dentine (the lower part of which may be osseous)," corresponding, you see, with the cementum of the tooth, "with a vascular pulp in its axis."

FIG. 16.



The view on the screen (Fig. 16), of a vertical section through the skin of an embryonic shark, showing the development of one of these scales, might easily be mistaken for a developing tooth.

This brings us to a specific consideration of that "general physiological law" under which the development of the teeth and other epidermoid structures takes place. The author of the paper under review studiously, or possibly innocently and "without malice aforethought," avoided all mention of a very important group of the derivatives of the epidermis. We shall see that there may be endless departures from the modifications of that which is somewhat ambiguously spoken of as a "law" in the evolution of tissues. Now, those epidermoid structures of which mention has been made originate as local growths of the outward skin in an outward direction. The slight infolding of the columnar layer of the epidermis always maintains its relations with the adjacent cells of this layer around it.

The glandular group of the epidermic derivatives, of which no mention is made, originate as local growths of the outer skin in inward direction. They are characterized in the formative stage by a dilatation of the end of the ingrowing tube or cord of the epithelium from which the glandular part of the organ is developed. To this group belong the sweat and sebaceous glands, the tear glands, and the mammary glands. The formation of the enamel-organ of the teeth, while not identical because of its slightly different functional purpose, very closely resembles the development of the skin glands. It was my observation of this fact which first led me to regard it as essentially glandular in its nature. Its process of growth in the early formative stages is the same. While the appendages which are outward growths begin as a shallow pouch or pocket in the outer skin, the development of the enamel-organ and the glandular organs begins as an epithelial cord which descends by a more or less tortuous course deeper into the dermal tissues, enlarging at the lower end. In the case of the enamel-organ, this epithelial cord is severed from its connection with the external skin layer shortly after the commencement of the formation of the dentine pulp. The cord is completely broken up and disappears, and the enamel-organ exists as an independent body having no connection with the external skin layers. This one fact completely demolishes the argument of my critics of similarity or "general physiological law," for the hair pouch always maintains its connection through the outer and inner root sheaths with the external skin layer. Another proof of the glandular nature of the enamel-organ is, that if it be removed in the early stages of the formation of the teeth, as can easily be done in the jaws of a calf, it will be found to be highly impregnated with lime-salts, which are being elaborated for the building up of the enamel. After the completion of the enamel at the tips of the cusps of the teeth, the enamel-organ at that point is thus exhausted, but still remains lower down on the sides of the tooth, where the deposit of enamel is not yet completed, until its perfect work is accomplished, after which it entirely disappears. The development of a tooth, then, is a modification of the methods by which both groups of the epidermal derivatives are formed.

The evolution of the enamel-organ is a modification of the process by which the skin glands are developed. Unlike the formations of either group, it is developed in a closed sac which has no connection with the external skin layer. Later on in the process of development, and after the completion of the crown, the pericemental

membrane makes its appearance, probably originating as a transformation either of the cells which constitute the lower part of the cap of the enamel-organ, or of those which form the lower part of the investing capsule or tooth-sac, and the connection of the tooth with the external skin layer is again established through the pericemental membrane. The formation and growth of the cementum of the tooth is thus seen to be a modification of the methods by which the outward growth of the external skin layer is effected.

My reference to the formation of embryonal corpuscles in the transition of the prismatic cells of the cap of the enamel-organ into ameloblasts is spoken of as a kind of physiological necromancy, in which it is necessary to "wholly and completely set aside every law of nature." Well, this is not the first instance in the history of the world of men attributing to magic phenomena which they did not understand. If my critic has not watched the process by which a tissue returns to its embryonal condition, he certainly has much to learn concerning retrograde metamorphosis. This would hardly be the proper time for me to enter into a discussion of the processes of inflammation, but, so far as this wonderful and orderly provision of nature applies to the development of the teeth, I am quite well prepared to demonstrate everything which I have asserted. The photograph on the screen (Plate II., Fig. 9) is from a section cut just prior to the commencement of the formation of either dentine or enamel. In the earlier stages *preceding* this the columnar layer of cells is plainly seen at the lower part of the enamel-organ. But at this stage they have entirely disappeared, and from them there has been developed a sheet of round embryonal corpuscles. Those constituting the lower layer of this sheet are destined to develop into the ameloblasts proper, which, while somewhat resembling the original columnar layer, are quite different in many essential features, being club-shaped, or larger at the ends and constricted somewhat in the centre. This photograph (Plate II., Fig. 10) is from the side of a tooth somewhat more advanced in development. Enamel has just begun to be formed at the tip of the cusp or cutting edge. Further down on the side, in the region from which this photograph was taken, the enamel-forming cells are just developing from the embryonal corpuscles. The upper portion of this sheet of embryonal corpuscles is developed into the flattened layers known as Nasmyth's membrane, which is clearly seen in any well-mounted specimen. (See also Plate I., Fig. 4.)

Leaving this part of my subject, I call your attention to the

structure of that layer of cells surmounting the tooth-pulp, and known as the odontoblasts. You are all aware that Prof. Heitzmann and his pupils, Drs. Abbott and Bödecker, have represented these bodies as round or oval nucleated corpuscles, between which the dentinal fibrillæ pass. Dr. Abbott, I believe, has stated positively that the dentinal fibrillæ are direct prolongations of non-medullated nerve-fibres, and they are so represented in his chart. Dr. Bödecker has stated it as his opinion that there is a direct connection. I had long been perfectly satisfied in my own mind that they were holding erroneous views of the origin of the fibrillæ, but it was not until a few months ago that I succeeded in cutting sections so thin that but a single layer of odontoblasts was represented. These specimens have been examined by Prof. Heitzmann, Dr. Bödecker, and Dr. Atkinson. Prof. Heitzmann had hardly more than glanced at one of the sections, when, with that perfect frankness which is so characteristic of this noble searcher after nature's truths, he admitted his mistake. Subsequently, while examining this specimen under my 1-25 inch objective, he thought he could detect very delicate fibres passing between the odontoblasts. But it is certainly established beyond all question that the dentinal fibrillæ proper are prolongations of the odontoblasts. The discovery that there are frequently two and sometimes three fibres projecting from a single cell, and that these cells are connected at their base by roots or processes with the reticulum of the pulp, and the fact that the pulp itself is a form of persistent embryonal tissue, as shown by the researches of Heitzmann and Bödecker, led me to the conclusion that they are a form of ganglion cell. The photograph on the screen (Plate I., Fig. 6) is from the periphery of the pulp of a completely developed tooth. It is plainly seen that the odontoblasts terminate in fibres, and close examination reveals some of them dividing into two or three. But this point is so difficult of elucidation that I shall depend largely upon the sections under the microscopes for a perfect demonstration.

I have stated in my recent series of papers in the *Dental Cosmos* that, since the announcement of my discovery of the ganglionic nature of the odontoblasts, I have frequently been asked how I explain the formation of dentine. Do these cells perform a double use? Are they elements of sensation, and also for the elaboration of the dentine? It would seem to be almost a self-evident conclusion that the material for maintaining the continued integrity of the dentine must be provided by these cells, for the living matter (the fibrillæ) which fills the canaliculi is a prolongation of these cells, as we have

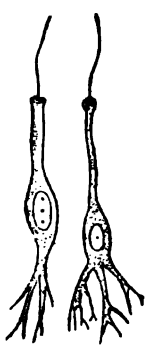
seen. If the supply of nutritive material for maintaining the continued integrity of the dentine comes from this source, why may we not logically infer that it was originally formed in this way?

A study of the physiological significance of the primary germinal tissues again finds practical application here.

We have seen that in many of the low forms of animal existence, the tissues of which are represented in higher forms while in an embryonal condition, where differentiation has made little progress, a multiplicity of function is performed by the same elements or cells. Pulp-tissue, therefore, being a persistent form of embryonal tissue, we should expect to find it performing a multiplicity of functions. The odontoblasts, while composed of what is essentially neural matter, are probably at the same time the active elementary agents in secreting the material for the formation and continued integrity of the dentine. Such instances of multiplicity of function are by no means rare in the lower forms of functioning bodies. In the myo-epithelial cells of Hydra, as seen in the view on the screen (Fig. 17), we have an instance of contractile fibres originating in epithelial cells. In the Protozoa there are found elements which perform the function of nerves and muscles at the same time. In the neuro-epithelial sense cells of Aurelia Aurita we have almost a perfect duplication of the odontoblasts. These are specially modified epithelial cells of the digestive tract. "They consist," says Balfour, "of an outward process which is prolonged into a fine hair, while their inner extremity terminates in fine processes which join a delicate network of protoplasmic fibres." One might easily mistake this for a description of the odontoblasts. (Fig. 18.)

Fig. 17.

Fig. 18.



Gentlemen, I hope I have made these matters plain to you, and I trust the contribution will prove, for the honor of the profession which I love, some slight addition to our rather scanty knowledge of an obscure subject. I also trust that in what I have said I have given no cause for offense. I have spoken earnestly and somewhat pointedly, because I could not but see that my critics seemed to hold the opinion that a knowledge which has grown out of the practical investigations of years could be brushed aside by a few hastily pre-

pared conclusions drawn from a superficial examination of inferior microscopical preparations. If they are willing to do the drudgery incident to this kind of work, and will go over the ground in the plodding manner that is necessary, I think we shall not be very far apart at the end. I now invite your attention to the exhibition under the microscopes, in which you will doubtless find the most interesting feature of the demonstration.

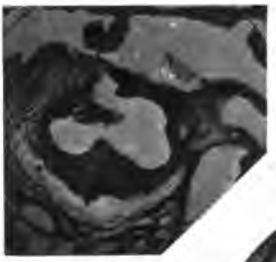
DISCUSSION.

Dr. ATKINSON: The demonstrations that have been made before us show so clearly the justification of the interpretations which have been made of the mode of development of the tissues, by a very few who were willing to walk in the way of understanding obedience to the presence that revealed it to their minds in this investigation, that I wish to refer, somewhat in detail, to the clear demonstration of how the mistakes have been made in previous interpretations, and to display the folly of men attempting to collate from the recorded statements of other observers, without personal experience in making sections themselves.

The history of how this came before us is a little peculiar. At the meeting of the New Jersey State Society at Asbury Park, Dr. Cryer presented me with his work which embodies his views on this subject. I characterized it to him as utterly erroneous and shameful for a teacher to present. His reply was this: "I was not sure that I was right, but I was determined to bring it before just such men as you, that if I were not right I might have the benefit of better intelligence than I possessed." I was induced to send a copy, of which he gave me three, directly to the essayist of the evening; and he informed me that the moment he received it the influence upon him was such that he could not do other than work faithfully in what he had been before convinced was the true path; and it is to these incessant currents of energy and study that have been so much decried by some who call themselves scientific *par excellence*, that we are indebted for what we have had.

I cannot find words to express my admiration for the manner in which the essayist has exposed the errors of those investigators who have taken advantage of their own mistakes and unskillfulness to prove their positions. He has shown how, in the pressing down of the cover-glass on the fluid in which the specimen is imbedded, they have separated tissues which should be joined.

PLATE I.



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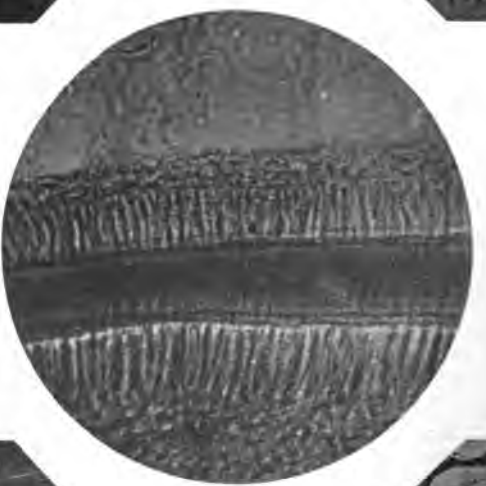

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PLATE II.

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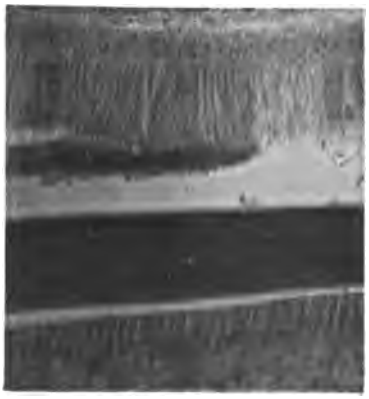

Dr. RHEIN: As the chairman of Section V., I would like to place on record the thanks that I feel to be due to Dr. Williams for the admirable paper which he presented to us the other evening. He is a young man who is and has been for a great many years working with the microscope, and under the most adverse circumstances.

The PRESIDENT: The Chair would call the gentleman to order, and would suggest, in doing so, that it is not in order in discussing a paper to discuss the gentleman who is its author.

Dr. RHEIN: I think everybody who heard the paper the other evening will bear me out in the view that it would not be out of place to say a few words in commendation of the author of the paper to which we listened.

Dr. CUSHING: It is not in order to discuss the merits of the writer of a paper. If we are discussing a paper we should confine our discussions to it.

The PRESIDENT: I think the point is well taken, and that the gentleman should discuss the subject under consideration, and not the writer of the paper.

Dr. RHEIN: If the Chair refuses to hear the report of Section V., I retire.

Dr. ABBOTT: Unfortunately for me, I was not present the other evening to listen to this paper, but there are one or two points in it that I want to speak of particularly, because they differ from what seems to have been the prevailing opinion of a few of us in New York previous to this time.

I would premise my remarks by saying that some one, I do not know who, said in Dr. Williams's hearing that the ground he had gone over was almost the same that Dr. Black had been over. I would state, in justice to Dr. Williams, that he has been over the same ground that Dr. Black went over; and that he was inspired to do so from seeing what Dr. Black had done; but he had no idea of detracting one single iota from anything Dr. Black has done.

I will state some points in which he claims priority. The first is the development of ameloblasts immediately under the flat layer of epithelial cells, which eventually forms over the crown of the tooth Nasmyth's membrane; the columnar layer of cells that was there when the enamel cap was first formed disappearing entirely, and what are called the enamel-formers, or ameloblasts, forming in their place, and the flat layer of cells which eventually forms Nasmyth's membrane, covering it up,—this, he claims, is his individual discovery. The next is, as shown by his first view, a section of the entire tooth

cut through longitudinally, showing the interdental tissues with the surrounding tissues in continuity. The next is the development of the dentinal fibres as branches from odontoblasts, several coming from one odontoblast. You who have read the article of Dr. Bödecker upon this subject will remember that he claims that, instead of the dentinal fibre starting out at the end of the odontoblast, and passing on into the canaliculi of the dentine, the non-medullated nerve-fibre runs from the pulp up between the fibres of the myxomatous tissue, going to the odontoblasts themselves, there becoming a part of the wall of the odontoblasts on either side, and then passing up between the ends of the odontoblasts, and so on, forming the dentinal fibre. Tomes's idea formerly was that the odontoblasts started off like links of sausage, something as Dr. Williams's illustration showed; and the point running out from the end was known as Tomes's dental fibre. Dr. Bödecker took the opposite position,—viz., that the dentinal fibres passed out between the odontoblasts; and I must confess that in the examination of many specimens I have seen exactly the same thing, and it was seemingly as plain as my hand is to you to-day. I have not seen the specimens of Dr. Williams's, but I have seen the drawings; and those drawings indicate but a slight difference from Dr. Bödecker's, so slight that it is not worth disputing about. He shows one, two, and sometimes three branches from one odontoblast, which penetrate the dentine and form the dentinal fibre. Now, we do not find the same form in every case. If we could have, in the same tooth even, in each mouth, a state of things in every case alike, it would be different. Then we could say that so and so is to be seen in certain kinds of teeth, etc. But instead of that you will find in every tooth varieties of particular things differing from others. The fact is, it is almost impossible to get two teeth that give us the same appearances; in fact, it would be difficult to cut two specimens from the same tooth, put them under the microscope, and have a view which would lead you to the conclusion that both were cut from the same tooth. I simply make these remarks to show that, no matter how carefully men may investigate and study this question, they will very often see things differently. I think we shall at no distant day arrive at a point, when no publication will be made of any histological work by any gentleman of a Section, without its having been carefully scrutinized by all the others of the Section, so that, when we present a paper here, we shall present it as a body, believing that we are right, and that we all see the specimens the same.

That is what we desire to do. In that way I think we can form a team to work which would have a better effect and influence than could possibly come from working by ourselves.

Dr. PEIRCE: I wish to say a few words in regard to the paper under consideration. I feel sorry that the gentleman who read the excellent paper gave so much importance to the views that had been advanced by Dr. Garretson and Dr. Cryer. It is well known to those who have studied the subject that in 1838 Mr. Goodsir published in England a very minute account of what he deemed the correct history of the development of the teeth; that is, that a tooth passed through three important stages, which he termed, first, the follicular stage, when the teeth were in this open groove; second, the saccular stage, when the groove closed; and third, the eruptive stage, when the teeth advanced and cut through the gums. He advanced the primitive dental groove theory in 1838, and for years it was the popular idea; but previous to 1868 Huxley and Magitot and others came to the conclusion that he was all wrong, and that the mistake which Goodsir had made was in the imperfect preparation of his tissues, or rather the imperfect manipulation of them; that he had wiped off the enamel cap, and left the dental groove. What I wished to express to you was that the views which Dr. Williams combated so skillfully were given more importance than they are entitled to, for they are not the results of the investigations of Garretson and Cryer, but were advanced by Goodsir, and have been entirely abandoned under the light of more recent investigations. These men were not original investigators: they had accepted those views simply because they had become familiar to them.

The work that has been done in this direction has not been easily done; and we in this country, as well as in England and on the Continent, have a proper appreciation, I think, of the credit due for the careful manipulation of material which has brought out the facts; and I know of no one who has pursued the subject more independently and faithfully than our friend Dr. Williams. I know of no one to whom greater credit is due for the results of his investigation. He has given us clearer ideas of the odontoblast and formation of the fibrillæ and tubuli than anyone else, I think, though his views are not widely different from those of others who have been over the same ground.

Dr. SPALDING: I did not understand Dr. Williams in his paper to consider it necessary to combat the old dental groove idea of Good-

sir. I understood that he merely made the explanation and exposition which he did to show the manner in which Goodsir and others were misled. I believe that was his object; because I am sure nearly every dentist in this country knows that that theory is pretty thoroughly exploded.

In regard to the layer of flat cells which lie in contact with the ameloblasts, that, I believe, is in accordance with what we know of the histology of other tissues. We know that the epidermic tissues are renewed from the layers below, and we know that the cells of the layers beneath are entirely different from the epidermic cells in form, and that conversion takes place whenever the cells from below rise and take the place of the epidermic cells. This case of the ameloblasts is in exact agreement with that idea.

Dr. ABBOTT: Only they are not reproduced; they do not wear off.

Dr. SPALDING: That is a question,—whether they are reproduced. We have a great many instances where the ameloblasts are destroyed, or at any rate where they fail to perform their office, where there is a fissure or something of that kind, which is closed subsequently. Now, the question is, whether the fissure is not closed from the transformation of flat cells to produce new ameloblasts. How otherwise can it be closed? It must be done in that way or by the budding process, or by the generation of new ameloblasts from themselves in some way; and we have no evidence of that. Therefore, it is not unreasonable to suppose that this flat layer should supply the material for ameloblasts when there is occasion for it. That there is frequent occasion for it is seen in the many teeth defective as to enamel, which we so often see and which seem to be increasing on our hands.

STANDING RESOLUTIONS.

The following standing resolutions are in force at this time, August 1, 1885.

Resolved, That henceforth no person shall be received as a delegate who is in arrears for dues, or until he has paid to the Treasurer the full amount due at the time his name was dropped for non-payment.

Adopted August, 1874.

Resolved, That hereafter no dental college shall be entitled to representation in this Association that does not require a good English education as a preliminary qualification for its matriculants, to be ascertained by examination.

Adopted August, 1879.

Resolved, That in order to secure representation in this Association, dental colleges must, subsequent to October, 1881, require all students entering therein to take two full courses of lectures previous to coming forward for examination and graduation, and must also state these conditions in their next annual announcement.

Adopted August, 1880.

Resolved, That hereafter no society shall be entitled to representation in this Association that does not require its members to live up to the requirements of our Code of Ethics.

Resolved, When it comes to the knowledge of the Committee on Credentials that any applicant for membership is violating our Code, said applicant shall not be received, and all such applicants shall be referred by the committee to the societies whose delegates they are, and in no case shall this Association be compelled to treat with violations of the Code, except where the violator is a member of this body and has no membership in any local society.

Adopted 1881.

Resolved, That the Secretary be instructed to assign members who may neglect to make their own choice the Section in which they are expected to work.

Adopted 1879.

Resolved, That the reports of Sections shall be called by the President in consecutive order, beginning each succeeding year one number higher than on the preceding year.

1879	commencing	with	No. I.
1880	"	"	No. II.
1881	"	"	No. III.
1882	"	"	No. IV.
1883	"	"	No. V.
1884	"	"	No. VI.
1885	"	"	No. VII.
1886	"	"	No. I.

Adopted 1879.

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